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GROUP DIFFERENCES IN PERCEPTUAL EFFICIENCY

by

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ABSTRACT

This dissertation was designed to investigate differences in perceptual efficiency among three mildly psychopathologic groups and a control group. The three groups were a duodenal ulcer group, a psychoneurotic group and an orthopedic group. It was predicted that the groups would differ in perceptual efficiency. Two experiments were based upon Gibson's theory of perception as a function of stimulation. Perceptual efficiency was measured first by using solid plastic objects called "feelies" in a crossmodal matching task. These measures were accuracy of matching and the time taken to make a correct matching. The second experiment used the standard Rorschach cards and provided a quantitative score of the information gained in the task.

The group differences were also predicted to be modified by verbal instructions to be more active in sensory exploration. It was considered that the differences in perceptual efficiency among the groups would be lessened because of the increased information due to increased stimulation from exporatory behaviour.

The experimental findings, studied by analyses of variance and analyses of covariance, were in the predicted

direction. In addition to the principle variables, two subsidiary independent variables, Vigor, a measure from the Gordon Personal Inventory, and Card Turns, a measure from the second experiment were included in the design to assess construct validity.

An application of active sensory exploration to psychotherapy was speculated upon in the final chapter. Further research with this model is required to assess its potential value as an approach to psychotherapy.

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CHAPTER 1

INTRODUCTION

A decrease in stimulus input is a central aspect of most theories of psychopathology. (Kaplin and Singer, 1963; Menninger, 1963; Ittelson and Kutash, 1961; Breuer and Freud, 1936). The patient is alienated from certain stimuli, internal and external, which would produce anxiety if admitted into awareness. Kaplin and Singer (1963) relate psychopathological states to the existentialist conception of a tendency to remove from awareness the fact of one's very being and the sense of responsibility implicit in the awareness of being or existing. The alienation of self is accompanied by intellectual, emotional, and physical passivity.

Measures of perceptual efficiency have been used to assess the relationship of psychopathology to stimulus input (Witkin, 1962; Ittelson and Kutash, 1961; Weckowicz and Sommer, 1960). Such studies described differences in perception between pathological groups and control groups. It is the purpose of this study to test the predictions:

1. that perceptual efficiency, as measured by the dependent variables described below, is a factor in psychopathology.

2. that in accord with Gibson's theory perceptual efficiency can be modified by verbal instructions to explore more actively.

3. and that the effectiveness of verbal instructions on psychopathological groups suggests an approach to psychotherapy.

The first two of these objectives converge to form the central idea in the dissertation, i.e., that lack of information input is a major factor in psychopathology. This relationship is to be demonstrated in two independent experiments in which the variable, "exploratory activity", to be defined, is manipulated for three mildly psychopathological groups; a psychosomatic group, a psychoneurotic group, and an orthopedic group. A control group is included in each experiment. Differences in perceptual efficiency of the four groups for two types of treatment will also be determined.

If it can be shown that psychopathology or the lack of it is related to the degree to which an individual can discover information from the input of stimuli, then the

elucidation of this relationship can lead to further research and a possible application to psychotherapy. Gibson, (1962) has shown, as will be discussed below, that the passive reception of environmental stimulation is not the same for an individual as the active reception of stimulation, insofar as information about the environment is concerned. If verbal instructions to a patient to increase his exploratory activity results in an observable increase in his perceptual efficiency and information processing, through a lessening of his passive reactivity and an increase in his exploratory behaviour, then such instructions have been therapeutic.

This dissertation relies heavily on Gibson's theory of perception, as a function of stimulation. The basic questions raised are:

1. Is psychopathology, in contrast to more normal states, related to less efficient stimulus input and consequently poorer information processing?

2. Does experimentally induced exploratory activity, in the Gibsonian sense, distinguish between pathological and control groups?

A theoretical and experimental examination of these questions constitutes the body of this dissertation.

Gibson's Theory of Perception as a Function of Stimulation

Gibson (1963) states:

> The crux of the theory of stimulation here proposed is the existence of certain types of permanence underlying change. These invariants are not, I think, produced by the acquiring of invariant responses to varying stimuli -- they are in the _stimuli_, at least potentially. They are the facts of stimulus ecology, independent of the observer although dependent upon his exploratory isolation of them. This kind of order in stimulation is not created by the observer, either out of his past experience or by innate preknowledge. Just as the invariant properties of the physical world of objects are not constructed by the preceiver, so the invariant properties in available stimulation are not constructed by him. They are discoverable by the attentive adjustments of his sense organs and by the education of his attention.

Gibson (1959) adds to the understanding of his technical language with the following statement:

> The word _perception_ in this essay means the process by which an individual maintains contact with his environment. The word _stimulation_ means the kinds and variables of physical energy in the environment to which the sense organs of the individual will respond. The theory suggests that perception is a function of stimulation. More exactly, it asserts that there is always some discoverable variable in stimulation--in the flowing array of energy at the sense organs of an animal--which determines the character of the perceptual process aroused by it.

Vision and touch and hearing function in basically the same way. All permit acquaintance with and response to substantial objects, places and events. The radiant energy of light or sound like the kinetic energy of pressure on the

skin are informative about an object. Gibson (1963) points out that the normal world is sufficiently full of motions and events to make a stream of stimulation possible. The normal activity of perception is to explore the world. Activity tends to alter the perspectives and arrays of stimulation. What exploratory activity does is to isolate the invariants. The sensory system can separate permanence from change only if there is change.

The Role of Attention and Exploratory Activity in Perception

Figure 1 shows the feedback loops for exploring stimulation and those for controlling behaviour. The sense organs are systems for exploring, searching and selecting ambient energy. They are capable of motor adjustment. Figure 1 shows on the left the modification of stimulation by reactions of the exteroceptive system and on the right the modification of reactions by stimulation of the proprioceptive system. The latter is a feedback system essential for the control of behaviour. Thus the organism has two feedback systems, one for obtaining information and one for modifying the environment. There are two kinds of action, one being exploratory action and the other performatory action. To the degree that an individual is exploratorily active will he be able to

The Role of Attention and Exploratory Activity in Perception

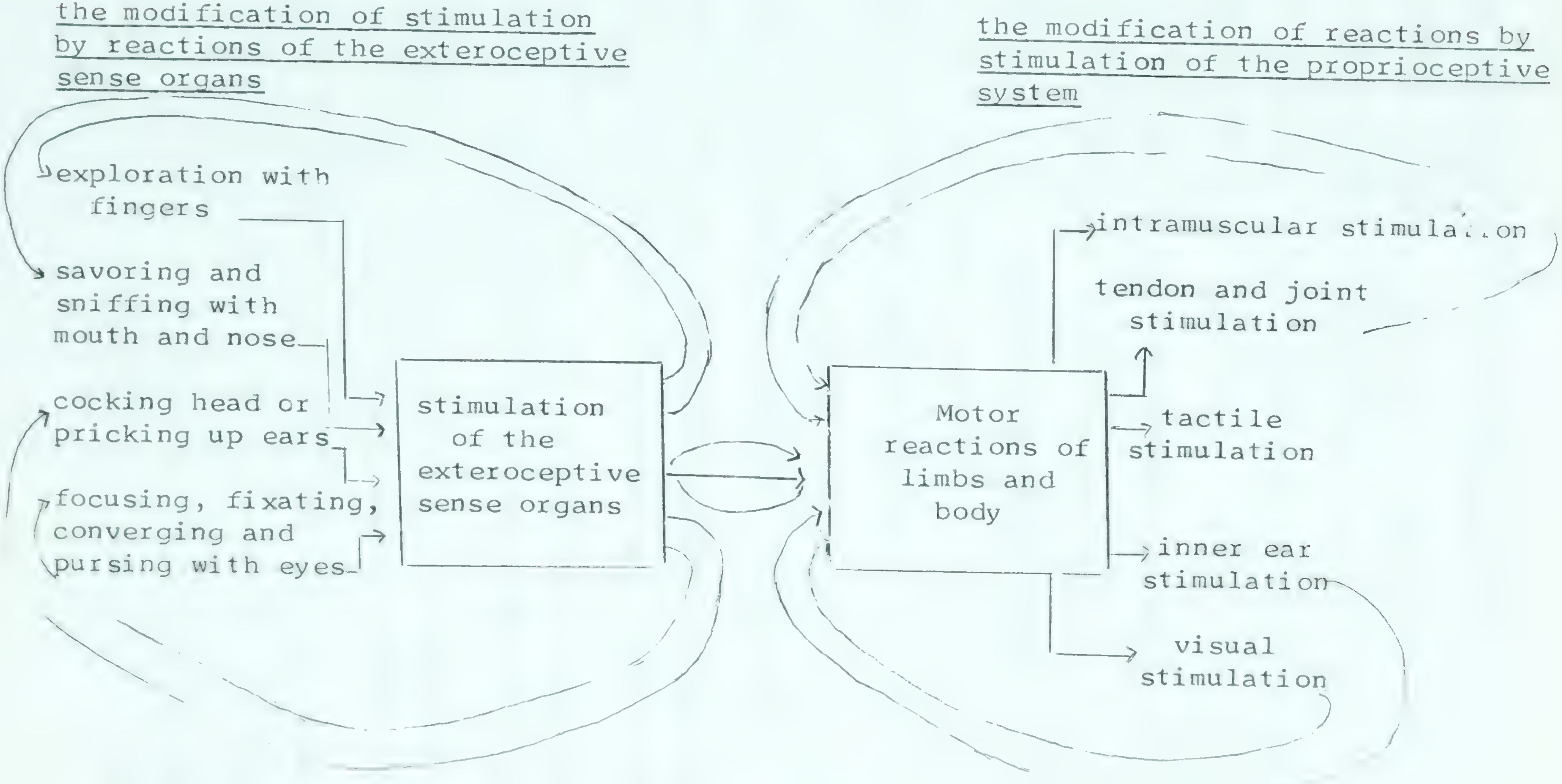

Figure 1

The feedback loops for exploring stimulation and those for controlling behaviour. (the angular lines represent physical action; the curved lines represent neural action.) Gibson (1963).

discover the invariants in the stimulation.

Gibson (1963) states that attention is a part of sensitivity. Sensitivity is synonomous with "the use of the sense organs" and refers to the effects of stimulation in general. By contrast, the term, "sensation" refers to conscious impressions induced by certain narrower selection of the variables of stimulation. Gibson says he would prefer the term, "esthesic system" to refer to the senses because it implies the molar consequences of sensitivity. Thus Gibson explains that, attention being a part of sensitivity, every esthesic system is an attentional system. Attention is not an intervening process but one that starts at the periphery. Light at the eye brings about focussing, fixating, converging, and exploring. Sound causes the head to turn. The primary reaction to pressure on the skin is exploration with the fingers. Similarly, Berlyne (1960, p. 95) states "that many orienting responses, such as shifting the gaze, or turning the head, or running the fingers over an object have a simulus selecting function". Thus there is a relationship between attention and the orienting response which may parallel the relationship which Gibson has established between attention and sensitivity. Figure 1 would indicate that attention, as Gibson

discusses it, is implicit in the functioning of the feedback loops on the left.

Berlyne (1960, p. 218) reports Ruzskaia's (1958) experiment on shape discrimination in children. The purpose was to show a relationship between "appropriate orienting responses" and perceptual efficiency. There were three groups of children one of which pressed a key when a triangle was shown thus using a performatory action only; another group which was asked to count the sides of the stimulus material while following them with the eyes; and a third group which was asked to follow the contours of the shape with fingers and eyes while counting the sides. The third group showed the most perceptual efficiency. Berlyne explains the improvement in terms of "a more appropriate exploratory response". Gibson would explain the improvement as the result of more effective discovery of the information in sensory stimulation.

The Informative Value of Stimulation

Stimuli are not deplete of meaning for Gibson; they contain information at least potentially. Gibson's (1955) investigations with visual stimuli led him to conclude that stimuli carry information about their source and that the

source is specified by the various hierarchies of sequences of stable patterns in the energy flux. Optical stimuli specify environmental objects by the relation of projection, Gibson (1960). Tactual stimuli, together with the concomitant proprioceptive component, specify environmental objects by the integration of the sensory input. He compares the environment to a reservoir of possible stimuli for perception. The meaning and information in these potential stimuli is available to the attentive exploratory reception of the organism.

Some stimulus invariants are relatively simple and easy to detect. An example is the optical texture which specifies a physical surface. This remains invariant over varying illumination and all transformations of perspective. Another example is the face of a mother for a young child. Intensity and wave length of light are irrelevant here but the invariant pattern is relevant. Spitz and Wolfe (1946) found a constant smiling response in infants two to six months old to any variety of human face. From among the multitude of varying patterns of visual stimuli the child discovered the invariant higher order constellation of stimuli which specify the human face. The invention of the

sound spectograph has shown that certain higher order variables of acoustic energy are the critical constituents of speech and the stimuli for hearing it. The pattern of a word is the same whether it is shouted, whispered or sung. Recently a pilot's last words, recovered from the crash scene and reconstructed on the spectroscope were intelligible to sound engineers by virtue of the invariant qualities in the patterning of speech.

When the eye scans an object the order of stimulation, which is an invariant pattern, remains unaltered but the order of excitation is different. Similarly when the fingers scan an object the order of stimulation is unaltered but the order of excitation is different. Stimulus energy is always an array and always a flow. The optic array with its capacity for projection in accordance with the laws of perspective geometry depends upon rectilinear propagation of light, and is the physical basis for pattern vision. The stimulus variables yielding information for vision must exclusively be found in a textured optical array, supplemented by the transformations relating a simultaneous pair of them, and by the transformations relating a continuous sequence of momentary arrays. (Gibson 1960, p. 457). Similarly the stimulus

variables yielding information for touch are to be found in a series of cutaneous pressure patterns with a pair of exploring hands, and no single pattern is ever like the shape of the object. From the inputs of the skin and joints together, from the sensory system, a clear perception of shape arises. The phenomenal shape of the object is invariant although the flow and array of sense data fluctuate from moment to moment. The sense of touch thus provides a clear example of the invariance of perception with varying sensations.

To illustrate the difference in the amount of information input from a situation involving active exploratory behaviour and one involving passive reception of stimulation, Gibson (1962) did an empirical study of active and passive touch. The same shape which can scarcely be distinguished with passive touch can readily be distinguished when explored by tactile scanning. The distinction between passivity and activity in touch and vision is that in the passive condition the individual makes minimal movements. The passive experience is atypical and is analogous to Gibson's (1950) visual field, i.e., the visual input from a fixed gaze and stationary head. Active touching and looking brings contact with the environment and is analogous to Gibson's conception of

the visual world, i.e., the visual input from active changing gaze and moving person.

In Gibson's (1962) experiment comparing the perception resulting from passive and active touch the sources of stimulation were six small metal cookie-cutters mutually different in about the same degree. In the condition for active touch the subject placed his hand palm up behind a curtain and was allowed to feel the object for several seconds. In the condition for passive touch a mechanical lever system was used to achieve uniformity of pressure and the object was pressed into the palm. The six forms were presented five times in each condition making a total of sixty trials. The subject matched the felt form with its drawing on a chart hung on the curtain in front of him. The results were ninety five percent correct matches for the active trials and twenty-nine percent correct matches for the passive trials.

Gibson also pressed the cookie-cutters against the palm and continually rotated them clockwise and anticlockwise in a twisting movement for several seconds. Thus providing passive but moving form perception. The same anatomical receptors were used as in previous trials but in this case the form of stimulation changed from one instant to another.

The perceptual efficiency results, in terms of accuracy, were significantly greater for this passive moving form condition.

In addition to the comparative results in perceptual efficiency the "active touch" experiments demonstrated that tactual form perception does not depend upon the pattern of local signs on the skin. In active touch it does not matter whether one finger is used or any combination of fingers. The whole shape of the cookie-cutter did not exist on the skin in active touch but only a changing pattern of pressures. In the condition of passive moving form perception the form of the object became most clear when the form of the skin-deformation was most unclear. It seems a paradox that the tactual perception corresponds well to the form of an object when the stimulus, in Gibson's sense, is formless and less well when the stimulus is a stable representation of the form of the object. Gibson gives this explanation:

> It might be that the skin does not have as its primary function the registering of form as this has usually been conceived. Impressions of form and location relative to the skin might be quite separate from and incidental to the use of the extremities as sense organs. The informative stimuli might well be incorporated in the seemingly complex motions and transformations of the skin. There must exist relations of separation and proportion which remain invariant over time, and which are specific to the object. They do not represent the shape of the object but they specify it. The solution to the problem of object perception in touch would be that continuous

> change in the proximal stimulation is accompanied by non-change, that is, the set of invariant relations. The former are not noticed; the latter is separated out and is attended to.
>
> The role of exploratory finger movements in active touch would then be to isolate the invariants, that is, to discover the exterospectific component in the flux of stimulation. Only thus could the above paradox be resolved.

The conclusion to be drawn from the experiments just described is that perceptual efficiency is increased by exploratory activity.

A second empirical study, completed by Gibson and Caviness (1962), illustrates an application of Gibson's theory. They investigated, (1) crossmodal equivalence in perception, i.e., the fact that visual and tactual stimuli are modally different, but that these different stimuli can lead to the perception of the same object and (2) ways by which the measure of crossmodal equivalence could be improved. The measure of crossmodal equivalence was defined as the percentage of correct matchings in a crossmodal situation. The objects visually and tactually discriminated were similar to the objects used in this present study.

Three groups of ten college students were each given a different practice condition. The control group had a no-training condition and served to establish the before

training level of performance. Subjects were presented with a seen-but-not-felt object and a felt-but-not-seen object and asked: are the objects the same or are they different? For each presentation the objects were presented simultaneously, some pairs being duplicates, some not. There was a three second time limit for each pair. The control group make judgements that were 66.6 percent correct.

The second group had a practice condition consisting solely of unlike pairs. Exploratory activity was uni-modal; the only comparisons possible were those between distinctive features of the objects as they were presented successively to both hands. After this practice session the second group were given the same task given the control group, i.e., they made crossmodal same or different judgements of shapes of all possible pairings of the objects. A significant improvement was discovered, judgements were 84.9 per cent accurate.

The third group had a practice condition which consisted of pairings of like objects presented crossmodally. The subjects knew the pairs were identical and they were asked to see an object and to feel its identical mate behind a curtain, as in the control situation. Six seconds were allowed and each identical pair was presented four or five

times. After this type of training the third group were given the control situation and no significant improvement in cross-modal equivalence was found.

Caviness questioned why the "tactual" training group improved while the "visual tactual" group did not. He left the answer to further study. That the "tactual" group would show significant improvement following practice in the particular condition is explainable by Gibson's theory. The subjects actively explored differences between different objects and discovered the invariants in the stimulation which specified the differences. When retested in the control situation the potential stimuli which specified the shape of the object were more readily rediscovered by practice. That the group which practiced comparing identical objects, visually and tactually, showed no significant difference in perceptual efficiency from the naive controls is also explainable by Gibson's theory of perception as a function of stimulation. The subjects had preknowledge that the objects to be matched were identical and the time limit was three seconds for the comparison. Both of these factors would minimize exploratory activity. The training set was to look for samenesses while the testing set was to discover differences, thus the

attentive aspects of exploratory activity were not the same in the practice and retest situations.

The conclusion from the discussion of the preceding experiment is that exploratory activity is related to perceptual efficiency.

Summary and Suggestions for Experimentation

Gibson's general thesis has been that the useful dimensions of sensitivity are those that specify the environment and the observer's relationship to the environment. Exploratory activity isolates the invariants in the flux of stimulus energy. The sensory system can separate permanence from change only if there is change. To the degree that an individual is actively exploring will he be efficient in discovering the information in stimulation. Gibson (1959) suggested that his theory has three parts: (1) A biophysical theory of the nature of stimulation which traces the chain of specificity between proximal energy at the receptors and the objects in the external environment. (2) A psychophysical theory of the basis of perception which states that perception is related to stimulation directly, dispensing with any intervening process. (3) A discriminational theory of the development of perception which suggests that improvement in

perceiving is a matter of discovering the meaning in stimuli instead of being a matter of supplementing meaningless sensation.

Gibson (1959, p. 468) suggests experimentation as a method to determine the potentiality of an individual for discriminating perceptual information. He states that if differential reactions can be established by speech, merely by "instructing" the observer, then the conditions for a psychophysical experiment are established. Gibson defines _a variable of stimulation_ as something with respect to which instances of stimulation differ. Such an independent variable would require an experimental setting which would permit observations to be made of differing stimulation. Gibson defines the "observations" of reactions to the varying stimulation as _variables of perception_, and these are the dependent variables. The two experiments of the present study which investigate differences in the perceptual efficiency of psychopathological groups follow Gibson's procedural suggestions.

CHAPTER 2

REVIEW OF RELATED THEORY AND RESEARCH

RELATED THEORY

While the main perceptual theoretical model is Gibson's theory of active exploration other theories provide the basis for the relationship between perceptual efficiency and psychopathology. The common contribution of these theories is the response to the question: what theoretical considerations explain why individuals with psychopathology have associated low levels of information input? Most theories of psychopathology discuss distortion of and inability to bring experienced information into awareness. Discussion here will be limited to initial inability or lack of ability to obtain information from perceptual processes. Neuropathological difficulties are also excluded from the discussion.

Berlyne (1960) discusses exploratory behaviour in relationship to making adequate perceptual discriminations. In his theory exploratory behaviour and the orienting reaction parallel exploratory activity and attention in Gibson's theory. Berlyne states that the individual must learn to orient

himself to the important stimuli in a situation by performing the correct exploratory responses before he can maximally achieve discriminations. Gibson (1959) points out that the reason an individual would fail to make a discrimination is because he is responding instead to some other variable of energy.

Colloquially put, the individual does not have his receptors tuned in to the relevant stimuli. Berlyne's concept of the orienting response, which intensifies attention and has exploratory functions, is analogous to a neural tuning process. In a very realistic sense perceptual information processing could be affected by the variables in stimulation to which the patient is attending. The appropriateness of the orienting response is a factor in obtaining information from incoming stimulation. The notion of inappropriate or diminuated sensitivity as a characteristic of psychopathology is given more attention in the following discussion.

Werner (1957) provided a theoretical basis relating perception and behaviour. He stated that perceptual development goes through an orderly sequence of stages, moving from initial diffuse, global reactions toward a final stage of integrated and differentiated patterns. A number of studies

have applied Werner's developmental framwork to Rorschach studies with the view to obtaining a Rorschach Maturation Level score that could serve as a criterion of psychological dysfunction. Hemmindinger (1953) and Friedman (1953) emphasized the structural and formal aspects of Rorschach percepts such as form level, location, and degree of integration of the percept. In this way differentiated responses based upon levels of perceptual development were obtained. The meaningfulness of this developmental approach has been supported in many empirical studies.

Reusch (1947), following Werner, theorized that the maturational level of psychosomatic patients was at a lower level than found in the normal population. He asserted that psychosomatic patients attend more to information received from the body than to information received from external sources, suggesting that the usual maturation growth from proximal to distal senses has not been accomplished. He states, "The trend indicates a regressive reaction with early infantile complex, great dependency on soothing tactile stimulation and on contact receptors rather than distance receptors".

Witkin, Dyk, Faterson, Goodenough and Karp (1962) offers "the differentiation hypothesis", concerning modes of

perception and this is along a continuum from being dependent upon and controlled by the environment to being relatively free to manipulate the environment in the process of perceptual orientation. Their hypotheses have been supported by empirical findings from extensive observations of perceptual tasks by many varied groups. (Witkin, Lewis, Hertzman, Machover, Bretnall, Meissner and Wapner, 1954). The developmental theory of Werner (1957) is referred to by Witkin to explain why some people perceive more globally and diffusely while others are more analytical and complex in the mode of perceiving. Differentiation refers to the relative complexity of an individuals mode of perceiving. A less differentiated mode of perception is homogeneous while a highly differentiated mode of perception is heterogeneous. In Werner's context, an important feature of the development of differentiation is the movement away from the initial inevitable union with the mother toward some degree of separation. The achievement of a differentiated self implies that in the area of experience where a perons's own activity is the source, the experience is relatively articulated, analytical, and structured rather than global and homogeneous. An analytical, in contrast to a global, mode of perceiving includes

a tendency to experience items as discrete from their backgrounds and reflects ability to overcome the influence of an embedding context. A dimension of individual differences, called field--dependence--independence distinguishes among individuals in accordance with the mode of perceiving. Witkins et. al. (1962) claim a high degree of individual self-consistency for his dimension of personality.

Witkins concluded that the presence or absence of psythopathology was not related to the mode of field approach. However he found that the kinds (italics in original source) or problems and symptoms are related to the mode of field approach. His empirical studies, indicate that a global approach or field dependent approach was found in patients with strong uncompensated feelings of inadequacy, passivity and helplessness. The opposite approach, field independent, characterized patients who were euphoric, expressed outward directed aggression, overideation and a continuing struggle for maintenance of identity. Witkin's theory would suggest that field dependent types of patients do not obtain much information from environmental stimulation.

Witkin's et. al. (1954) study indicated that "a tendency toward 'active coping' or 'passive submission' was the

dimension of personal functioning that was most closely associated with field--dependence--independence". The 1962 report criticized this belief as being too inclusive and suggested that activity as a factor in perception be subdivided among several facets. The facet of sheer motoric expenditure of energy was considered unrelated to the mode of field approach. The facets of "directed activity" and of "active attitude" were so related. There is a comparison between "directed activity" and "exploratory activity" in the Gibsonian sense because both direct the attention to the perceptual goal.

Menninger (1963) and Horney (1951) represent the psychoanalytical point of view in the discussion of the relation of exploratory activity and psychopathology. Neither writer deals specifically with the former but descriptive inferences may be made from how they characterize neurotic behaviour. Menninger states:

> That the essential qualitative change in neurosis is a slight but definite detachment of a person from his environment. There is a distinct lowering of performance and achievement. The ability to correctly identify and evaluate aspects and objects of external reality is lowered. Work, play, productivity and social inter-course are usually to some extent impaired. When the real world is shut out, when the normal sources of energy, stimulation, new information, correct bearings and the like are in any way diminshed, there is a partial or threatened closure of the ego system.

Horney (1951) outlines a theory of neurosis of which the dynamic centre is a basic conflict between attitudes of "moving away from", "moving against", and "moving toward", people. The function of neurotic detachment is seen in the first attitude of "moving away from" people. A resolution of the conflict by withdrawal and passiveness enhances the conflict with increasing anxiety. Horney says, "What struck me most forcibly was the blindness of patients toward obvious contradictions within themselves". The attitude of "moving toward", people was characterized by dependency needs. The attitudes of "moving against" people included qualities of hostility, sadism and self-alienation.

The inference from these two psychoanalytical reviews is that the neurotic would be relatively inefficient in information processing. In Gibsonian terms perceptual inefficiency would be a consequence of inadequate or misplaced sensitivity.

RELATED RESEARCH

The related theory discussed above has produced empirical findings which have relevance to the two experiments of this dissertation. A small sample of the related research

is presented in the following order: that related to psychosomatic reactions, that related to neurotic reaction and thirdly some findings which are related to perceptual efficiency in the orthopedic patients.

Lebowtiz (1963) investigated differences in visual perception, auditory perception and motor behaviour among normal, psychosomatic and schizophrenic subjects. Visual perception was studied by use of the standard Rorschach procedure and scored in accordance with Werner's theoretical position, which yields scores on genetic-early and genetic-late perceptions. Auditory perceptual differences were studied by means of integrating sounds from a tape. Subjects were asked to make up a story integrating fifteen patterns of sound. Psychomotor behaviour was studied by having the subjects do a series of seven motor tasks--performatory activity--and the mean time score was taken as a measure of psychomotor integration. It was found that the normal group demonstrated a higher level of perceptual functioning and hierarchical integration than the duodenal ulcer group in the visual and auditory modalities. In the psychomotor area, a significant difference was approached but not reached.

Clemes, Tanous, and Kantor (1963) hypothesized a

positive relationship between the level of perceptual organization as measured on the Rorschach and the occurrence of functional illnesses. Functional illness included both neurotic patients and psychosomatic patients. Clemes et. al., found that the scores from the "functional illness" group differed significantly from an "organic illness" group in terms of the maturity level of perceptual integration. These investigators stated that the effects of a perceptual organization characterized by a predominance of diffuse unarticulated percepts might be that the individual would tend to overgeneralize without being aware of doing so. Such a tendency would lead to inappropriate behaviour and exacerbation of stress.

Hamilton (1955) reviewed twenty research projects concerning the personality qualities of duodenal ulcer patients. His survey indicated general agreement about character traits of these patients that they presented a syndrome classified as "anxiety-neuroses". Hamilton's own research on the problem of dyspepsia included two hundred subjects, fifty duodenal ulcer patients, fifty gastric ulcer patients, fifty non-ulcer dyspepsia patients and fifty controls. The data about personality characteristics were obtained from an inventory of the questionnaire type. His factor analysis

yielded three factors which he considered to represent anxiety, guilt and dependence. He was able to classify the groups in ascending order of neuroticism: control, gastric ulcer, duodenal ulcer and non-ulcer dyspepsia. Hamilton replicated his study two years later with a different series of patients and secured essentially the same findings.

Callaway and Thompson (1953) studied the interaction of sympathetic activity and perception. Earlier theory, Alexander (1950), suggested that chronic disturbance of the vegetative process in the form of chronic hyperactivity of the sympathetic system, could lead to tissue changes. Callaway et. al. predicted that if sympathetic activity were experimentally increased there would be a negative feedback which would produce a reversal of sympatheticotonic character traits (Eppington-Hess 1920). "There should be a narrowing of awareness, a sort of introversion, which could be called decreased exteroceptive input". Callaway designed his perceptual experiment along Gibsonian principles. (Visual World 1950). He induced sympathetic hyperactivity in two different experiments and his prediction was borne out in both. He concluded that sympathetic hyperactivity can produce less efficient perception and that such inefficiency can be

explained in terms of narrowed awareness with reduction in reaction to distal cues.

Although Callaway did not relate his findings to Alexander's theory of the psychodynamics of sympathetic hyperactivity when physiological processes are inhibited there is a logical connection. Alexander's ulcer patients and Callaway's experimental subjects, both suffering the distress of sympathetic hyperactivity tend to "withdraw from outward directed activity".

Experimental evidence of a decrement in processing information input in psychopathology, with particular reference to the psychoneurotic group comes from an experiment carried out by Davis and Cullen (1958). Their subjects were groups of psychoneurotics, psychotics and a normal control group. The perceptual task was the recognition of simple pictorial material with increasing illumination of the projection screen. It was found that the neurotic group took longer to recognize the pictorial content and offered more guesses than did the normal control group.

Kaplan and Singer (1963) tested the hypothesis that highly dogmatic individuals should exhibit significantly lowered sensory acuity when compared to individuals who are

relatively free of dogmatism. Dogmatism was defined as the score obtained from the Rokeach Dogmatism Scale (1960, pp. 71-100). The perceptual task tested the efficiency of five sensory modalities; olfactory, gustatory, tactile, auditory, and visual. Specifically Kaplan and Singer predicted that the more autocentric modalities - those listed first in the preceding sentence - would be less efficient in highly dogmatic people than in less dogmatic people. The more allocentric modality of vision being more capable of objectifying the environment was considered less likely to be affected by an individuals lessening awareness of self. The results of the experiment supported the hypothesis and the most significant differences were co-ordered with the degree of autocentricism. The difference in visual acuity between high dogmatic and low dogmatic people was not significant.

Kaplan and Singer state that if neurosis is viewed as dogmatism of sorts, that is having the common qualities of restriction of planning, rigidification of personality and withdrawal then the results of this experiment indicate that neurosis entails a degree of sensory alienation. Exploratory activity in the Gibsonian sense has as its main function the objectifying of the environment, a function which would

appear somewhat limited in highly dogmatic individuals.

The psychopathalogical correlates of orthopedic disability have been described generally in the literature on rehabilitation. Specific research about personality characteristics and their relationship to how inactive hospitalized patients perceive the environment is less available. Perman and Rapoport (1953) observed one patient for a period of three months and reported: "in general, besides physical inactivity, there is depression, extreme infantilism, paranoid tendencies, and poorly developed object relationships". Spitz (1946) found that patients who suffer mild sensory deprivation through a long inactive illness develop unusual perceptual disturbances and suggestibility. Forster (1953) observed the effects of long term hospitalization upon changes in personality. He describes the apathy and withdrawal symptoms of his subjects and points out that these are not related to any particular disease but rather to the social environment of an institution.

Allport (1960) reports a research by Apple (1960), which investigated how people "perceive" illness (quotations in the original). What configuration of experience informs of illness? The findings of the research were that (1)

symptoms were present, (2) they were acute and well defined, and (3) the symptoms must lead to an impairment of activity. These criteria are additive in any pathology.

A research study related more closely to the second experiment in the present dissertation concerns the relative changes in perceptual efficiency due to psychotherapy. Jonietz (1950) used Rorschach blots, not in the standard manner, but as simple perceptual material to investigate the content of perceptions before and after therapy. Twelve experimental subjects and twelve control subjects were asked for responses. Following therapy in the Rogerian tradition a retest of the experimental group indicated quantitatively and qualitatively improved content. The retest content of the control group showed little change. Jonietz interprets the perceptual improvement of the therapy group to be a consequence of the increased ability to change and the lessening of repression. The experiment did show changes in the organization of visual perception during psychotherapy and these changes did not occur in the absence of psychotherapy.

That psychopathology and restricted information processing are related has been the central theme of this chapter. Empirical evidence, having a basis in the theories appears to support the existence of this relationship.

CHAPTER 3

EXPERIMENTAL DESIGN

In two separate parallel experiments, referred to as Experiment A, the Perceptual Efficiency Task and Experiment B, the Perceptual Information Task different stimulus material was manipulated by verbal instructions to study the effect of such instructions upon selected dependent measures of perceptual efficiency. Perceptual activity was observable in Experiment A through the visual and tactual contact with solid plastic objects, "feelies", and in Experiment B with the manipulation and viewing of the patterns of the Rorschach cards. In each experiment there were two treatment conditions: (1) a non-treatment condition in which a test and a retest occurred and (2) a treatment condition in which a test and a retest preceded by the verbal instructions to increase exploratory activity occurred. The first condition tested the hypothesis of no significant differences in perceptual efficiency between a test and retest without instructions. The second treatment condition tested the hypothesis concerning group differences in responding to the instructions to explore the stimulus material more actively.

THE VARIABLES

1. The Independent Variables. For both experiments, the main independent variables were the effective exploratory activity with which the individual responded to the instructions to be more active in the sensory modalities and the psychopathological groups. Two subsidiary independent variables were the Vigor score and the Card Turns score. The first subsidiary variable, Vigor, is not related to the instructions to be more active, but since it is a self-assessed opinion about personal activity it is hypothesized to be correlated with the perceptual efficiency measures. The second subsidiary variable is affected by the instructions and also since it is defined as the total number of manipulatory movements of the stimulus material in Experiment B, the Perceptual Information Task, it is related to the measure of perceptual efficiency for that experiment.
2. The Dependent Variables. These are the measures of perceptual efficiency which are dependent upon exploratory activity for their magnitude. For Experiment A, the Perceptual Efficiency Task, they are:

(a) Accuracy - the number of correct crossmodal, tactical visual, matchings of the plastic objects.

(b) Time - is the average time taken to make the crossmodal matchings regardless of accuracy.

(c) Time-Accuracy - is the average time divided by the number of correct pairings in the crossmodal matching task. It is the average time taken to make a correct discrimination.

For *Experiment B*, the Perceptual Information Task, the measure of perceptual efficiency is *the total points score* from each trial of ten Rorschach cards. This score, the number of human forms perceived, is described in the discussion of Experiment B.

HYPOTHESES

1. *For Experiment A*. *The Perceptual Efficiency Task*.

(a) In a non-treatment situation, the groups will differ significantly in perceptual efficiency as measured by the Accuracy Score, the Time Score and the Time-Accuracy Score.

For Experiment B. *The Perceptual Information Task*.

(b) In a non-treatment situation the groups will differ significantly in perceptual efficiency as measured by

the Information Point Score.

2. <u>For Experiment A</u>. <u>The Perceptual Efficiency Task</u>.

    (a) In a treatment situation, the groups will not differ significantly in perceptual efficiency as measured by the Accuracy Score, the Time Score and the Time-Accuracy Score.

    <u>For Experiment B</u>. <u>The Perceptual Information Task</u>.

    (b) In a treatment situation, the groups will not differ significantly in perceptual efficiency as measured by the Information Point Score.

3. There will be a significant negative correlation between the independent variable of Vigor and the dependent variables of Time and of Time-Accuracy. There will be a significant positive correlation between the descriptive variable of Vigor and dependent variables of Accuracy and the Information Point Score.

THE SAMPLE

Four groups of subjects were selected, three on the basis of a common syndrome of psychopathology and a control group. The pathological groups were a duodenal ulcer group, a psychoneurotic group, and an orthopedic group. In the

particular case of the orthopedic group, in addition to the assumed mild psychopathology, the patient was required to be in hospital at least three months in a physically restricted situation. Precautions were taken to exclude any patient with visual defect, central nervous system defect, inhibition of movement in arms, hands or neck, or patients under the effect of therapeutic drugs. A control group, judged to be free from psychopathology and physical disability was included in the experiment on the assumption that such a group will reflect normal perceptual efficiency.

(1) The Control Group

The control group was selected from volunteers on the basis of a distribution of age from twenty years to sixty-five years. Twenty-two were hospital nursing orderlies, thirteen worked as army clerical and maintenance staff, carpenters, salesmen, and mechanics and five were professionals with University degrees. When perceptual efficiency measures from this latter small group were compared statistically with the group measures there were no significant differences. A brief medical history was taken from each member of the control group to preclude inclusion in the experimental groups.

TABLE 1

MEAN AGES AND S.D. OF GROUPS

Group	N	Mean Age	S.D.
Control	40	42.0	11.9
Duodenal Ulcer	40	46.5	9.0
Psychoneurotic	40	37.4	11.4
Orthopedic	40	39.1	11.4
All groups	160	41.25	11.5

(2) The Duodenal Ulcer Group

Of the duodenal ulcer subjects twelve were out-patients visiting the hospital for routine pension examinations, eight were army personnel who were tested during their working hours and twenty were patients who were admitted to hospital because of exacerbation of their symptoms. Each individual in this latter group was tested within twenty-four hours of his admission.

(3) The Psychoneurotic Group

TABLE 2

PSYCHIATRIC CLASSIFICATION OF THE NEUROTIC GROUP

Type of Neurosis	Number
Anxiety Neurosis	13
Neurotic Depression	15
Character Neurosis	1
Inadequate Personality	6
Hysteria Neurosis	3
Obsessive Neurosis	2
Total	40

In the psychoneurotic group all but three subjects who were outpatients were tested after admission to hospital. Five subjects were in hospital in excess of four weeks prior to being included in the experiments. The majority of subjects were tested within a few days of admission to hospital.

(4) The Orthopedic Group

TABLE 3

CLASSIFICATION OF ORTHOPEDIC PATIENTS

Type of Physical Restraint	Number
Bodycast, Stryker frame or bed.	27
Wheel chair:	
(a) Hip injury	7
(b) early multiple sclerosis	3
(c) Post-polio	1
Leg Injury	2
Total	40

All orthopedic patients were tested in the Rehabilitation Wing of the Calgary General Hospital. An additional prerequisite qualification for inclusion in the experiment was that the patient must be in hospital at least three months prior to testing. This qualification was stipulated to provide a basis for including a relatively sensory deprived environment as an experimental variable. For twenty-seven of

these patients the arrangement of experimental apparatus had to be modified because of the inability of the patient to assume a sitting position. In these cases a standard method of putting an adjustable table across the restraint apparatus and tilting the patient slightly above horizontal was effected.

TREATMENT

Treatment was the modification of the independent variable, exploratory behaviour, by means of instruction. The assumption was that instructions to increase the movements of the sensory receptors set off a causal chain which eventuated in increased perceptual efficiency. The instructions were carefully designed to assure increased exploratory activity.

Two treatment situations or conditions were included in each experiment. A non-treatment situation is a test followed by a retest. It was assumed that the subject will utilize his customary or usual present capacity for exploratory activity in a simple test-retest situation. The non-treatment situation permitted the testing of the hypothesis that there will be no significant difference in treatment

effects in a retest by practice alone.

Forty subjects were randomly assigned to either treatment condition by a table of random numbers. Thus each diagnostic group and the control group had twenty subjects in the <u>non-treatment situation</u> and twenty subjects in the <u>treatment situation</u>.

It is suggested that treatment, as defined and used in the two experiments, is analogous to a miniature form of psychotherapy. Should treatment be effective there would be a lessening of group differences in perceptual efficiency. There should also be significant differences in the means of any dependent variable from a given group when such differences are compared from the non-treatment and treatment situations.

STATISTICAL METHOD

<u>Procedures and Tests of Significance</u>

1. <u>Experiment A</u>. <u>The Perceptual Efficiency Task</u>.

The data from each of the three perceptual efficiency measures Accuracy, Time and Time-Accuracy, were analyzed by a separate two by four factorial covariance design. In addition, each of these three measures was analyzed, insofar as

the non-treatment situation is concerned by a two by four factorial analysis of variance design.

2. Experiment B. The Perceptual Information Task.

The data, comprising a square root transformation of the Information Point Scores, were analyzed by a two by four factorial covariance design. In addition these scores were analyzed insofar as the non-treatment situation is concerned by a two by four factorial analysis of variance design.

The covariance factorial design, as described by Winer (1960, p. 395) was used for both experiments because the groups differed before treatment. The post-test scores were adjusted by the covariance method for difference in the pretest scores.

The statistical method of covariance analysis has four underlying assumptions. Winer (1960, p. 586) lists these as freedom of the covariants from treatment effects, homogeneity of variance for both the covariate and criterion measures, linearity of within-class regression and linearity of between-class regression. He indicates that the F tests in the analysis of covariance are robust with respect to violation of the assumption of homogeneity of variance in the X and Y measures. The X measures are the pretest scores and the Y

measures are the post-test scores. He states that the effect of nonhomogeneity of within-class regression has not been studied but suggests that if the between-class regression is linear it is reasonable to assume that the within-class regression is linear under the condition that the covariate is not affected by treatment.

The data for Experiment A and Experiment B meet all these criteria for the use of the covariance model. Table 4 indicates the results of the tests on the assumptions underlying the covariance method. It will be noted that between class regression is linear for each of the four covariance factorial experiments and only in the Time-Accuracy measures was heterogeneity of variance observed.

Procedures Specific to the Hypotheses

1. For Hypothesis 1.

The four analyses of variance designs, three from Experiment A and one from Experiment B, analyzed treatment effects on each variable in a non-treatment situation. The purpose was to show that significant group differences were present but independent of treatment effects in a non-treatment situation, i.e., there will be no improvement in perceptual efficiency in a retest by practice alone.

TABLE 4

TESTS ON THE ASSUMPTIONS UNDERLYING THE COVARIANCE MODEL

	Tests for Homogeneity of Variance		Tests for Linearity of Between Class Regression
	Covariate X	Criterion Y	
	F max	F max	F
Experiment A			
Accuracy	2.59	3.55	5.87
Log Time	3.44	4.72	7.51
Time-Accuracy	7.16	33.0	6.47
Experiment B			
$\overline{\text{PIT}}$ Point Score	2.40	3.78	36.9

NOTES:

1. Critical ratio for F max (8, 19) at .99 level is 5.30
2. Critical ratio for F (6, 151) at .99 level is 2.92
3. For tests on Linearity of Between Class Regression see Winer (1960, p. 587).

2. *For Hypothesis 2*.

Each of the four covariance analyses, three from Experiment A and one from Experiment B, tested the null hypothesis that there will be no significant group differences

for each of the dependent variables in a treatment situation.

3. For Hypothesis 3.

The product moment correlations were computed for the Accuracy, Time, Time-Accuracy, Perceptual Information Point Score, and Card Turns Score from each treatment condition. Included in this computation were also the Vigor score and the data for Age. This latter variable was included to determine whether Age would be significantly correlated with any measure of perceptual efficiency. The main finding for testing Hypothesis 3 was the correlations between Vigor and the perceptual efficiency scores.

4. The Vigor scores were analyzed by the method of analysis of variance in a single factor design (Winer 1960, p. 70) to determine if there were significant differences among the groups.

THE EXPERIMENTS

EXPERIMENT A, THE PERCEPTUAL EFFICIENCY TASK

Apparatus

The sources of stimulation in this experiment were ten solid plastic forms constructed by the writer to correspond with the design of a similar set of ten objects at Cornell

University. Gibson, (1962), (1963). They were designed to provide a maximum of visual and tactual stimulation. The larger Cornell objects are four inches high and narrower in the horizontal dimension and weigh eight ounces. Each object has six curved protuberances on the front half and a convex rear half. Valleys or saddles of varying depth and distribution separate the protuberances which are asymetrically situated. Each object is considerably different and there are two sets of ten so that each object has an identical mate. The Cornell objects have no planar surface but can be set erect on the edge of the curved back and the two leading lower protuberances. The Alberta objects, (called "feelies" because they are meant to be felt with both hands), were originally sculptured from 2½" spheres of clay and differ from the Cornell objects in that there is a small planar surface on the bottom to facilitate more variation in the placement of protuberances and to enable the object to be set securely upon the table-bench. A black pigment was added to the clear liquid plastic before it was poured into the mould so that each object has a uniform smooth black surface.

Arrangement of the Apparatus

A table-bench, with dimensions of 40" long, 10" high, 4" wide at top, and with an 8" side-base, was positioned on the testing table so that the subject's elbows could rest on the table and his hands can extend to beneath the bench. A set of ten objects, (the seen-but-not-felt set), was positioned in a definite order by number, 1½ inches apart and 1 inch from the leading edge of the bench. The position number of each object was stencilled on the bench and was easily read by the subject. An opaque cloth, 40" by 14" was draped from the leading edge of the table-bench. This cloth was thrown back over the objects until the task begins.

Seven "feelies", from another identical set, were placed in a box out of sight of the subject and were arranged in order of presentation shown on the scoring sheet. In order that a uniform field of vision was obtained the subject sat on an adjustable stool so that his nose was eighteen inches above table level and pointed directly at the midpoint of the table-bench.

Procedure

In general, the experimental method is as follows: The subject was seated at the table in the previously

described position. He was given an instruction card to read at which instant the cloth was dropped from concealing the objects on the table-bench and drapes the table before the subject. The subject complied with the instructions and placed his hands under the cloth. The hands were visible to the experimenter who was seated opposite. The first felt-but-not-seen object was placed into the left hand in a uniform manner, i.e., the convex side down and the planar surface towards the fingers, and the stop watch was started at the moment of impact. When the subject called out the number of his matched choice from the table-bench the watch was stopped. Time and accuracy were recorded on the score sheet. The second felt-but-not-seen object was presented and the task continued until all seven felt-but-not-seen objects were presented.

In the non-treatment situation the subject complied with the instructions of Card 1:

> Notice that these objects are numbered from one to ten. I will put into your hand, under the cloth, an object which is identical to one of the ten you see before you. Feel it in any manner you wish and call out the number of its identical mate.

and after doing the complete task he was given the same instruction card and did the whole task again. Thus two sets

of accuracy and time scores were derived, one set from the initial test and another set from the retest. However, for the treatment situation the subjects received Card 2, in the retest, which instructed them as follows:

> We will repeat the process. This time will you be very active with your feeling and looking. Use your hands freely and make your eyes look over the objects very often. Call out the number of the object as soon as you have identified it.

The subjects proceeded to do the task under these more exploratory active conditions. After two of the matchings had been done the experimenter said: "Use your hands freely and make your eyes look over the objects very often." Card 2 and the verbal reinforcement were considered to be the main treatment in the experiment. The treatment situation yielded two sets of accuracy and time scores. It was the scores from the post-test in the treatment situation which were considered to be modified by treatment.

EXPERIMENT B, THE PERCEPTUAL INFORMATION TASK

This is a second experiment in the application of Gibson's theoretical considerations. If the findings should result in the acceptance or rejection of hypotheses parallel to those in the first experiment there would be a fair degree

of construct validity in the whole study.

Apparatus

The source of stimulation in Experiment B was each of the ten standard Rorschach cards. This source was selected because of the highly structured, yet ambiguous and equivocal aspects of the pattern and shading in each card. Gibson (1960, p. 609) discussed the structure of a stimulus. It is a reasonable assumption from a Gibsonian point of view that the subject will be able to register the capacity of light to carry the structure of photic stimulation to the eye. The more the variations in visual stimulation are explored and attended to the greater the probability that information can be abstracted from the stimulation. It was postulated in this experiment that when the subject is instructed to attend to and vary the stimulation he will more readily perceive content to which his attention is directed.

Method

In general the method of Experiment B parallels that of Experiment A. Each group was randomly divided into the Treatment situation. One division received a standard instruction card and carried out a test and a retest on the

basis of these instructions. The second division carried out the initial test on the basis of the standard instruction card but received an additional instruction card for the retest. The first division of subjects is said to be in <u>a non-treatment situation</u>, while the second division of subjects is said to be in <u>a treatment situation</u>.

The experimental method for Experiment B was as follows: The subject sat at the table with the ten Rorschach cards before him, with the first card exposed and in the standard position. The subject reads Instruction Card 1:

> Here are ten ink blot cards. People see many shapes and figures on each of them. Will you particularly look for what might resemble the human figure. Point it out to me and tell me about it. After you have found all you can, put the card down and I will give you another.

When the subject read the instruction card he was given the first Rorschach card in the upright position. His responses were recorded verbatim and all movements of the card in his hands were recorded by use of symbols. Each card turn has a symbol and these were counted after the task to ascertain the quantity of manipulations of the cards. In the non-instruction condition, after the subject had completed the task, he was given Instruction Card 1 again and the task was repeated. Thus two sets of scores were derived from the test and

retest situation.

The twenty subjects in the treatment condition received Card 1 and carried out the task. However for the retest they received Card 2 which instructed them:

> Will you look at each of the ten cards again. This time make your eyes move freely over the card and move the card any way you wish. Look for what might resemble the human figure, point it out for me, and tell me about it.

After the second Rorschach card had been completed under these conditions of increased exploratory activity the experimenter said aloud: "This time make your eyes move freely over the card and move the card any way you wish". The responses and card turns were recorded as before. The scores from the post-test in the treatment situation were considered to be modified by treatment.

Scoring Method

The responses from the Perceptual Information Task were scored as follows:

1. A percept, including the whole human figure, engaged in some form of activity .... Score 2 points
2. A percept including the whole human figure. Score 1 point
3. A percept including partial human figure ..Score ½ point

The total points from a protocol comprise the P.I.T. point score and there are two such scores for each individual.

The contribution of the subsidiary independent variable, Card Turns, will be discussed in Chapter 4.

THE RELATIONSHIP OF THE VIGOR SCALE TO THE DESIGN

Personal propensity to activity and movement are related in Gibsonian theory to perceptual efficiency, and within the frame of reference of the present thesis to psychopathology.

To indicate the possibility of variations in the quality of personal vigor among several experimental groups it was necessary to obtain a measure of this quality for each group. The Vigor Scale of the Gordon Personal Inventory, Gordon (1963), was chosen to give this measure.

In the Inventory four factorially constructed scales contribute one item each to twenty sets of four items. Gordon arranged his quartets of items so that each set of four contained two items with positive social reference and two items with negative social reference. Couch and Keniston, (1960) discussed item choice, by the subject, as a manifestation of personality. The Vigor scale is one of the four scales of the Inventory and in selecting it for use in the present study the assumption was made that the choice of

items would reflect some manifestation of personality along a passivity-activity continuum. The Inventory is less susceptible to the drawbacks of most self-assessment tests because the subject may make two choices, one most like him, and one least like him, from among four items. Following Experiment A and Experiment B in the testing session for a subject the Gordon Personal Inventory was administered and the Vigor Scale score was recorded.

CHAPTER IV

RESULTS

The experimental findings of how the subjects in the different groups perceived when not specifically instructed and when specifically instructed to be more exploratorily active are reported in this chapter. Each single variable of perceptual efficiency was analyzed in a separate factorial design. Thus from Experiment A, each of the variables, Accuracy, Time, and Time-Accuracy were studied by an analysis of variance method in the non-treatment situation and also by an analysis of covariance method in the treatment situation. The variable, Perceptual Information Point Score, was similarly treated for Experiment B. These eight analyses provided the procedures by which hypotheses one and two were accepted or rejected.

THE NON-TREATMENT SITUATION

The Analyses of Variance

The analyses of variance were used to test the hypothesis of significant differences between groups and no significant differences in treatment for a test-retest

situation. Tables 5, 7 and 10 illustrate these analyses for Experiment A. Table 12 contains the comparable data from Experiment B, for the Perceptual Information Point Score.

The Accuracy Measure

Table 5 indicates that the groups are significantly different in terms of the accuracy with which the subjects made the visual-tactical discriminations of the plastic objects. It also shows no significant differences in the non-treatment situation, that is when the subjects are not instructed to vary the stimulation.

The interaction between the group scores and the test-retest situation was significant. A survey of the variation in the mean accuracy scores, see Table 6, would point up this interaction. The control group improved its mean accuracy score by 0.70 in the retest while the orthopedic group improved by only 0.30, the neurotic group by 0.35 and the ulcer group not at all.

The group differences in accuracy were compared by the method of orthogonal components, (Winer 1960, p. 67). The only significant difference was found between the control group and the ulcer group. The difference between the control group and the orthopedic group approached the 5% level

TABLE 5

SUMMARY OF ANALYSIS OF VARIANCE ACCURACY MEASURE

Source of Variation	SS	df	MS	F
A. Non-Treatment Test-retest	6.81	1	6.81	1.20
B. Groups	80.67	3	26.89	4.77**
AB	82.44	3	27.48	4.88**
Within Cell (error)	405.35	72	5.63	

*Sig. at 5% level
**Sig. at 1% level

TABLE 6

MEANS AND STANDARD DEVIATIONS ACCURACY MEASURES NON-TREATMENT SITUATION

Group	Test	Retest
Control	4.30 S.D. 1.58	5.00 S.D. 1.58
Ulcer	2.75 S.D. 1.58	2.75 S.D. 1.29
Neurotic	3.35 S.D. 1.37	3.90 S.D. 1.67
Orthopedic	3.20 S.D. 1.69	3.50 S.D. 1.59

of significance but did not reach it. There were no significant differences among the means of the psychopathological groups.

The Time Measure

Table 7 is a summary of the analysis of variance of the log transformation of the Time measures for the groups. The non-treatment situation indicated no significant difference between the test and retest scores, but the time used by the subjects in the groups to make the discrimination of the plastic objects was significantly different.

Table 8 is a summary of the group log time means and standard deviations. Table 9 reports the same data in the raw score form to facilitate easier scrutiny of the differences among the means.

The significant interaction between group scores and test-retest scores is again explained by the fact that each group, except the neurotic group which was slightly faster in the retest, was slower by varying amounts of time on the retest. The ulcer group for example had an average loss of 8.7 seconds while the orthopedic group were slower in the retest by only 3.3 seconds. These variations in the group performances were sufficient to bring about the interaction shown in Table 7.

TABLE 7

SUMMARY OF ANALYSIS OF VARIANCE LOG TIME MEASURES

Source of Variation	SS	df	MS	F
A. Non-Treatment Test-retest	0.030	1	0.030	0.416
B. Groups	1.264	3	0.421	5.84**
AB	1.307	3	0.435	6.04**
Within Cell (error)	5.264	72	0.072	

*Sig. at 5% level
**Sig. at 1% level

TABLE 8

MEANS AND STANDARD DEVIATIONS LOG TIME SCORES NON-TREATMENT SITUATION

Group	Test	Retest
Control	1.6019 S.D. .2270	1.6522 S.D. .2220
Ulcer	1.6338 S.D. .2270	1.6982 S.D. .2220
Neurotic	1.7699 S.D. .1360	1.7548 S.D. .1570
Orthopedic	1.8534 S.D. .1930	1.8612 S.D. .1500

TABLE 9

MEANS AND STANDARD DEVIATIONS TIME SCORES (Seconds)
NON-TREATMENT SITUATION

Group	Test	Retest
Control	46.5 S.D. 31.0	50.7 S.D. 26.6
Ulcer	48.4 S.D. 21.6	57.1 S.D. 31.2
Neurotic	61.8 S.D. 19.8	60.3 S.D. 20.4
Orthopedic	73.4 S.D. 17.3	76.7 S.D. 23.5

When the differences between means for the groups were examined by the method of orthogonal components (Winer 1960, p. 67) it was found that the means of the control group differed significantly from the means of the ulcer group, the neurotic group, and the orthopedic group. There were no significant group differences between any pair of means from the psychopathological groups.

The Time-Accuracy Measure

Table 10 summarizes the analysis of variance for the data related to the Time-Accuracy measure. The subjects

showed no significant differences in the test-retest situation without instruction. The four groups differed in the time taken to make each correct match of the seen-but-not-felt and felt-but-not-seen objects.

The low but significant interaction between groups and the test-retest situation, noted in Table 10 was due to the large improvement on the retest made by the neurotic group. This was a gain of 7.5 seconds compared to very minor retest changes made by the other groups. Table 11 illustrates this point.

An examination of the group means in Table 11 indicates the source of the significant F ratios shown in Table 10. There were significant group mean differences between the control group and all the other groups. The neurotic group mean from the retest was significantly different from the ulcer and orthopedic group means. However in the pretest there were no significant differences among the psychopathological groups.

TABLE 10

SUMMARY OF ANALYSIS OF VARIANCE TIME-ACCURACY MEASURE

Source of Variation	SS	df	MS	F
A. Non-Treatment Test-retest	233	1	233	0.341
B. Groups	7349.9	3	2450	3.58*
AB	7706.3	3	2568.8	3.76*
Within Cell (error)	49,208	72	683.44	

*Sig. at 5% level
**Sig. at 1% level

TABLE 11

MEANS AND STANDARD DEVIATIONS TIME ACCURACY MEASURE NON-TREATMENT SITUATION

Group	Test	Retest
Control	13.0 S.D. 10.2	11.5 S.D. 7.5
Ulcer	27.5 S.D. 25.3	27.9 S.D. 22.1
Neurotic	25.5 S.D. 15.5	18.0 S.D. 7.6
Orthopedic	30.4 S.D. 22.3	29.6 S.D. 19.3

The Perceptual Information Point Score

The Perceptual Information Point Score from Experiment B, measures the quantity of human form responses seen in each of the standard Rorschach cards. The non-treatment situation, was hypothesized to yield non-significant differences insofar as treatment is concerned. It was also hypothesized that the group scores would be significantly different. Table 12 is the summary of the analyses of variance which examines these intergroup relationships for the Perceptual Information Point Score. Results similar to those found in the analysis of each variable from Experiment A were also found for the variable from Experiment B.

The group means were examined to determine where significant differences were located. Using the method of orthogonal components, it was found the control group means from both test and retest differed significantly from the group mean of the ulcer group, 5% level, and from the group means of the neurotic and orthopedic groups at the 1% level. In the retest alone the ulcer group mean was significantly different from the neurotic and orthopedic group means, at the 1% level. The performance of the control group is the major cause of the significant differences among means in the

pretest situation. In the retest situation the ulcer group improved sufficiently by practice to show significant mean differences from the neurotic and orthopedic groups. These latter two groups were similar in perceptual performance.

The explanation of the significant interaction shown in Table 12 is similar to that found for the previous interactions in Tables 5, 7 and 10. The magnitude of the differences between the test and retest means for the groups are not consistently similar. Table 13 indicates that these differences range from 0.34 for the controls to 0.01 for the neurotic group. To contribute more decisively to the interaction effect the orthopedic group has a negative difference of -0.55.

TABLE 12

SUMMARY OF ANALYSIS OF VARIANCE
SQUARE ROOT OF INFORMATION POINT SCORE

Source of Variation	SS	df	MS	F
A. Non-Treatment Test-retest	0.81	1	0.81	0.632
B. Groups	43	3	14.33	11.19**
AB	44.6	3	14.88	11.62**
Within Cell (error)	92.3	72	1.28	

*Sig. at 5% level
**Sig. at 1% level

TABLE 13

MEANS AND STANDARD DEVIATIONS SQUARE ROOT OF INFORMATION POINT SCORE NON-TREATMENT SITUATION

Group	Test	Retest
Control	3.68 S.D. 0.824	4.02 S.D. 1.20
Ulcer	2.89 S.D. 1.05	3.01 S.D. 1.06
Neurotic	2.55 S.D. 0.567	2.56 S.D. 0.894
Orthopedic	2.79 S.D. 0.764	2.24 S.D. 0.741

Summary of Results from the Non-Treatment Situation

The results from the three analyses of variance experiments, Accuracy, Time, and Time-Accuracy, from Experiment A support Hypothesis 1(a) that there are significant group differences in perceptual efficiency as measured by these three variables under the condition that subjects received no instruction to vary stimulation. The analyses show that under this condition the subjects tend generally to exhibit consistency in perceptual efficiency over the time interval of the test-retest. This is indicated by the non-significant F test on the mean square of the non-treatment test-retest

situation.

Examination of the differences in group means for each of the measures by the method of orthogonal components, (Winer 1960, p. 67) indicated that the perceptual efficiency of the control group was most effective in producing these differences. To a lesser degree the perceptual efficiency of the ulcer group was different from that of the neurotic and orthopedic groups. These latter two groups showed no significant mean differences in any of the three measures of perceptual efficiency in a non-treatment situation.

The analysis of variance for Experiment B, The Perceptual Information Task, showed similar findings to those of Experiment A in the non-treatment situation. The same conclusion, that the control group contributed most to the significance of differences of the group means, and the ulcer group to a lesser degree was reached. There were no significant differences between the mean scores of the neurotic and orthopedic groups. On the basis of the analysis of variance of the Perceptual Information Point scores Hypothesis 1(b) was accepted.

THE TREATMENT SITUATION

The Analyses of Covariance

The four variables, Accuracy, Time, Time-Accuracy, and Information Point Score were studied in the Treatment situation by an analysis of covariance for each variable. The pretest scores of each was the covariate and the post-scores of each was the criterion measure. The results, which provide evidence for rejecting the null hypothesis that there will be no significant differences between the adjusted group criterion measures following treatment, are summarized below for each analysis of covariance.

The Accuracy Measure

Table 14 is the summary of the analysis of covariance for the accuracy measures. The instructions to be more exploratorily active before the post-test in the treatment situation were significantly effective. The groups were significantly different in perceptual efficiency as measured by the accuracy of the crossmodal matching task.

The means and standard deviations of the observed accuracy scores from the treatment situation are reported in Table 15, together with the adjusted retest means. Comparison of group mean differences was carried out by using the F

test (Winer 1960, p. 585) for testing the significance of differences between all possible pairs of adjusted treatment means. The control group showed a difference in accuracy, significant at the 1% level, from the ulcer group, the neurotic group and the orthopedic group. There were no significant differences between the adjusted means of the psychopathological groups. It would appear that the superior adjusted retest score of the control group accounts for the significant group differences reported in Table 14. Inspection of Table 15 would bear out this finding.

The significant interaction between the treatment and diagnostic groups shown in Table 14 emphasizes the differential improvement in perceptual efficiency of the control group. Table 15 shows that this group improved with treatment an average of 2.35 matchings while the neurotic group improved only an average of 0.40 matchings. The ulcer group and the orthopedic group have only a difference of 0.45 between the average improvements. The differential reactions of the individuals in the test and retest situation in the different groups account for the interaction effect.

TABLE 14

ANALYSIS OF COVARIANCE ACCURACY MEASURES

Source	SS	df	MS	F
A. Treatments	A'yy = 26.1	1	26.1	26.1**
B. Groups	B'yy = 34.1	3	11.36	11.24**
AB	AB'yy = 15.7	3	5.23	5.07**
Error	E'yy = 153.2	151	1.01	

*Sig. at 5% level

**Sig. at 1% level

TABLE 15

ACCURACY MEASURES

MEANS AND STANDARD DEVIATIONS AND ADJUSTED RETEST MEANS TREATMENT SITUATION

Groups	Test	Retest	Adjusted Retest
Control	3.40 S.D. 1.42	5.75 S.D. 1.17	5.70
Ulcer	2.80 S.D. 1.16	4.15 S.D. 1.62	4.53
Neurotic	3.35 S.D. 1.73	3.75 S.D. 1.54	4.45
Orthopedic	3.55 S.D. 1.24	4.45 S.D. 1.65	4.32

The Log Time Measure

The observed time scores were rescaled to their logarithm values to meet the assumptions underlying the analysis of covariance. Table 16 is a summary of the analysis of covariance using the transformed data. This summary indicates that although the treatment effects are significant, the mean square for the groups is not significant. Each group appeared to be no different than another insofar as the time used to make a crossmodal match is concerned. This result occurred when the treatment was significantly effective and when the retest scores were adjusted for differences in the pretest scores.

The differences in the group treatment means were tested by the method of Winer (1960, p. 585). It was found that the control group did not differ from the ulcer group in the adjusted retest score following instructions, but did differ significantly from the neurotic group and the orthopedic group. The ulcer group mean scores differed significantly in the direction of shorter time from the mean scores of the neurotic group and those of the orthopedic group. The latter two groups showed no significant differences in the adjusted retest score following treatment. Inspection of the

adjusted means in Table 17 supports these calculated findings.

The significant interaction between treatment and diagnostic groups shown in Table 16 is due to the highly different rates of improvement of the control group and the orthopedic group. The differences in the improvement of the retest over the pretest for the ulcer group and the neurotic group are almost identical. Since there is a significant interaction the finding for insignificant group effects is dependent upon the variation in the treatment.

TABLE 16

ANALYSIS OF COVARIANCE LOG TIME MEASURES

Source	SS	df	MS	F
A. Treatments	A'yy = 0.458	1	0.458	22.5**
B. Groups	B'yy = 0.056	3	0.0186	0.914
AB	AB'yy = 0.921	3	0.307	15.09**
Error	E'yy = 3.072	151	0.0203	

* Sig. at 5% level
** Sig. at 1% level

TABLE 17

LOG TIME MEASURES

MEANS AND STANDARD DEVIATIONS AND ADJUSTED RETEST MEANS TREATMENT SITUATION

Groups	Test	Retest	Adjusted Retest
Control	1.6944 S.D. .2530	1.5153 S.D. .3200	1.5163
Ulcer	1.5867 S.D. .1850	1.4812 S.D. .1972	1.4820
Neurotic	1.7659 S.D. .1655	1.6667 S.D. .1748	1.6250
Orthopedic	1.8755 S.D. .1811	1.8065 S.D. .1860	1.6632

The Time-Accuracy Measure

Table 18 is a summary of the analysis of covariance for the Time-Accuracy measure. It will be recalled that this variable measures the time in seconds that a subject takes to make a correct crossmodal matching of the plastic object. It is a measure of the efficient use of time.

The groups, see Table 18, varied significantly in response to the instructions to be more exploratively active. The significant group mean square confirmed that the groups vary in perceptual efficiency as measured by the Time-Accuracy

variable.

The adjusted retest means are shown in the third column of Table 19 and indicate that the control group and the ulcer group contributed most to the significance of the treatment mean square. The adjusted means were compared for significant differences after the method of Winer (1960, p. 585). The control group adjusted retest mean was significantly different in the improved direction from the adjusted retest mean of the neurotic group and the orthopedic group. The control group did not differ from the ulcer group. The difference between the ulcer group adjusted retest mean and that of the neurotic group is not significant. The ulcer group adjusted mean is significantly different from that of the orthopedic group. The perceptual efficiency, as measured by the Time-Accuracy measure, of the neurotic group and the orthopedic group is not significantly different after treatment. The interaction of treatment and diagnostic groups for the Time-Accuracy measure is significant at the 5% level. It is attributable to the differences in the test and retest scores of the control group. The relative gains in the retest scores of the other three groups are less separated and contribute less to the significant interaction.

TABLE 18

ANALYSIS OF COVARIANCE TIME-ACCURACY MEASURE

Source	SS	df	MS	F
A. Treatments	A'yy = 2069.6	1	206.96	24.5**
B. Groups	B'yy = 1380.1	3	460	5.45**
AB	AB'yy = 885	3	295	3.49*
Error	E'yy = 12,754	151	84.45	

*Sig. at 5% level

**Sig. at 1% level

TABLE 19

TIME-ACCURACY MEASURES

MEANS AND STANDARD DEVIATIONS AND ADJUSTED RETEST MEANS TREATMENT SITUATION

Groups	Test	Retest	Adjusted Retest
Control	18.8 S.D. 10.0	6.4 S.D. 3.0	8.39
Ulcer	18.2 S.D. 9.3	9.2 S.D. 6.5	11.93
Neurotic	23.4 S.D. 14.9	16.6 S.D. 11.7	16.89
Orthopedic	26.4 S.D. 15.2	20.0 S.D. 13.8	17.97

The Information Point Score

Experiment B, the Perceptual Information Task, was the parallel study and the measure derived from this task, the Information Point Score, was analyzed to ascertain if results comparable to those from Experiment A could be obtained. Gibson's (1959) perceptual theory is basic to both experiments

Table 20 is the summary of the analysis of covariance for the Information Point Score, hereafter abbreviated to P.I.T. score. A square root transformation was done on the observed P.I.T. scores in order to meet the assumptions which underlie the covariance model.

It was found that the treatment was significantly effective in this experiment, Table 20, and that the groups were significantly different. The significant treatment effects were analyzed by comparing the group adjusted retest means to determine where significant differences occurred. The method was that used for these comparisons with the data from Experiment A.

The comparisons of the adjusted retest group means yielded information comparable to that obtained by this analysis of data in Experiment A. The adjusted retest means of

the control group and of the ulcer group tended to be similar and be significantly different from the adjusted retest means of the other groups. There were no significant differences between the adjusted means of the neurotic group and those of the orthopedic group in the treatment situation.

The explanation of the significant interaction between treatment and groups shown in Table 20 was due to the varying magnitude of the differences between test and retest means of the groups. The control group and the ulcer group both improved equally well in the treatment situation while the neurotic group and the orthopedic group had minor gains between the test and retest means. Again the conclusion to be drawn from the interaction is that perceptual efficiency is not independent of the diagnostic group.

TABLE 20

ANALYSIS OF COVARIANCE SQUARE ROOT
OF INFORMATION POINT SCORES

Source	SS	df	MS	F
A. Treatments	A'yy = 15.51	1	15.51	64.62**
B. Groups	B'yy = 139.95	3	46.65	194.37**
AB	AB'yy = 53.31	3	17.77	74.04**
Error	E'yy = 35.51	151	0.235	

*Sig. at 5% level
**Sig. at 1% level

TABLE 21

PERCEPTUAL INFORMATION POINT SCORE
MEANS AND STANDARD DEVIATIONS AND ADJUSTED RETEST MEANS
TREATMENT SITUATION

Groups	Test	Retest	Adjusted Retest
Control	3.63 S.D. 0.794	4.79 S.D. 0.870	3.955
Ulcer	2.40 S.D. 0.638	3.59 S.D. 0.616	3.967
Neurotic	2.49 S.D. 0.840	2.85 S.D. 0.815	3.138
Orthopedic	2.32 S.D. 0.683	2.53 S.D. 0.919	2.987

Summary of Results from the Treatment Situation

The results from two of the three covariance analyses in Experiment A and the results from the covariance analysis in Experiment B, reject the null Hypothesis 2(a) and 2(b), that in a treatment situation there will be no significant group differences in perceptual efficiency as measured by the dependent variables in each experiment. The one exception to rejecting the null hypothesis, i.e., the Log-Time variable in Experiment A, was due to the interaction effects between the two levels of treatment for the groups.

In each analysis of covariance it was found that the significant mean squares resulted mainly from the superior improvement in perceptual efficiency of the control group. Tests on differences of adjusted retest means in the treatment situation revealed this finding in each analysis of the Accuracy scores, the Time scores, the Time-Accuracy Scores and the P.I.T. scores. The difference between the control group and the ulcer group adjusted retest means was insignificant in three of the four analyses, the Accuracy measure being the significant exception. In all four analyses of covariance of the perceptual efficiency measures, the adjusted retest mean scores of the neurotic and orthopedic groups did not differ significantly. It can be concluded that the control group adjusted retest means contributed most to the group differences of all measures. The adjusted retest means from the ulcer group were not significantly different from those of the control group. The neurotic group and the orthopedic group adjusted retest mean scores did not differ from each other but consistently were significantly different from the means of the control and ulcer group.

Significant interactions between treatment and groups were found in each of the four analyses of covariance.

Examination of the wide degree of variation between test and retest scores for the groups indicated that the diagnostic groups were contributing to the interaction by reason of differing improvement or decrement rates between the test and retest scores. The study of interaction effects supported the conclusion that the control group tended to make greater improvement in the retest over the pretest. The ulcer group was not far behind in this regard, while the two other groups tended to make small but similar gains in the retest with treatment. These interactions lend support to the conclusion that perceptual efficiency is a function of membership in a group.

VIGOR SCALE RELATIONSHIPS

The Vigor scale from the Gordon Personal Inventory was included in the experimental design, (see Chapter 3), to provide an assessment of group propensity for movement and activity. Hypothesis 3 stated that Vigor, defined as a subsidiary independent variable, would be correlated with the measures of perceptual efficiency, i.e., that there will be a significant positive correlation between "Vigor" and the variable of Accuracy and P.I.T. Score and also a significant

negative correlation between Vigor and the Time and Time-Accuracy variables.

The product moment correlations among the variable were calculated and are summarized in Tables 22 and 23. In addition to the correlations specific to Hypothesis 3, other correlations which have reference in the following discussion are included in the tables. The correlations have been computed from the scores of all individuals regardless of diagnostic grouping hence the hypothesis that each correlation is significantly different from zero is tested with a total N of 160. Table 22 contains the data from the non-treatment situation while Table 23 shows the correlations from the treatment situation. Two variables, having no relationship to treatment are shown in both tables. These are Vigor and Age. The latter has not been previously included in the design. Table 23 shows that Age has an insignificant relationship to any other variable.

The results obtained from computing the correlations between Vigor and the measures of perceptual efficiency indicated that Hypothesis 3 was accepted. The total Vigor Scores correlated positively with the total Accuracy scores and the total P.I.T. scores and were significantly different

than zero at this level. The negative correlation with the Time-Accuracy scores was significantly different than zero at the 2% level and the negative correlation with the Time scores was significant at the 6% level. The conclusion is that there is a relationship between the subjects' self assessed attitude to activity and his perceptual efficiency.

To study the possibility of variations in the quality of personal vigor among the groups an analysis of variance of the single factor type, Winer (1960, p. 62) was carried out on the Vigor scores from the four groups. While these findings are not relevant to testing the specific experimental hypotheses if it can be shown that the groups differ in self-assessed attitude to activity then the relationship between psychopathology and exploratory activity will be more meaningful.

TABLE 22

CORRELATIONS BETWEEN ALL VARIABLES IN NON-TREATMENT CONDITION

Variable	Time	Accuracy	Time Accuracy	P.I.T. Point Score	Vigor	Card Turns	Age
Time		145	383	073	-078	-002	-049
Accuracy			-517	214	109	113	-160
Time - Accuracy				-122	-107	-070	092
P.I.T. Point Score					330	416	-027
Vigor						210	012
Card Turns							022
Age							

NOTE: Decimal points omitted

TABLE 23

CORRELATIONS BETWEEN ALL VARIABLES IN TREATMENT CONDITION

Variable	Time	Accuracy	Time Accuracy	P.I.T. Point Score	Vigor	Card Turns	Age
Time		-091	551	-244	-122	-078	-082
Accuracy			-579	373	231	322	-186
Time - Accuracy				-348	-162	-249	096
P.I.T. Point Score					394	502	-039
Vigor						210	012
Card Turns							022
Age							

NOTE: Decimal points omitted

TABLE 24

SUMMARY OF ANALYSIS OF VARIANCE GROUP VIGOR SCORES

Source of Variation	SS	df	MS	F and F max
Group Vigor Score	2903	3	967.60	17.5**
Error	8594	156	55.08	

F max = 2.56

**Sig. at 1% level
*Sig. at 5% level

Table 24 is the summary of the analysis of variance for the Group Vigor Scores. It indicates that there are significant differences among the groups for the Vigor Scores. An examination of the differences between the means for the groups was done by the method of orthogonal comparisons Winer (1960, p. 67). It was found that the control group differed from all other groups. The ulcer group had significantly higher Vigor scores than the neurotic and orthopedic groups. All differences were significant at the 1% level. The neurotic group and the orthopedic group did not differ in the quality of self-assessed Vigor. Table 25 is a summary of the mean Vigor Scores for the groups. The division into the two treatment situations was for the purpose of showing

the consistency of the scores within the groups. It is recalled that different subjects were randomly assigned to either treatment condition. Neither treatment situation affected the Vigor scores of the subjects. The calculated differences between the group means were readily verified by inspecting Table 25.

TABLE 25

MEANS AND S.D. FOR VIGOR

Group	Non-Treatment Situation	Treatment Situation
Control	27.1 S.D. 4.4	27.9 S.D. 4.0
Ulcer	22.7 S.D. 6.8	22.4 S.D. 6.3
Neurotic	18.5 S.D. 6.7	14.7 S.D. 6.8
Orthopedic	18.9 S.D. 8.7	19.2 S.D. 7.4

FINDINGS CONCERNING THE CARD TURNS

Card Turns was the subsidiary independent variable in Experiment B. Its measure was the total number of turns or manipulatory movements of the Rorschach cards during any one test. Findings about Card Turns were not relevant to the three specific experimental hypotheses but were reported to provide a reference for the discussion of how active manipulatory exploratory movement has a bearing in perceptual efficiency. This finding became apparent in the positive correlation within the treatment condition between Card Turns and the Perceptual Information Point Score. Table 23 showed this correlation to be 0.502 and the level of probability that it is significantly different from zero exceeds the .0001 level. This finding supported the Gibsonian theoretical viewpoint that there was a positive relationship between perceptual efficiency and exploratory behaviour. Evidence of this relationship was strengthened by the comparison of the correlation between Card Turns and the P.I.T. scores in the non-treatment situation and the corresponding correlation from the treatment situation. The difference between these two correlations was significant beyond the 1% level of probability. Table 22 and 23 contains the relevant

correlations.

Table 26 is a summary of the means and standard deviations for the Card Turn variable. Inspection of these data would indicate significant differences between the control group and all the other groups. The group mean differences among all the psychopathological groups were not significant for both the non-treatment situation and the treatment situations. Inspection of Table 26 further shows that each psychopathological group made significantly more Card Turns in the Treatment situation than in the Non-treatment situation. There was no significant increase in card turns for the control group in the treatment situation. Even with treatment the psychopathological groups made significantly less card turns than the untreated control group.

TABLE 26

MEANS AND S.D. FOR CARD TURNS

Group	Non-Treatment	Treatment
Control	36.8 S.D. 17.4	37.9 S.D. 10.8
Ulcer	15.9 S.D. 14.9	24.3 S.D. 9.3
Neurotic	13.6 S.D. 10.6	22.1 S.D. 13.3
Orthopedic	14.7 S.D. 9.9	23.9 S.D. 12.5

CHAPTER V

DISCUSSION OF FINDINGS AND IMPLICATIONS FOR FURTHER RESEARCH

Discussion of Hypothesized Results

For hypothesis 1(a) and 1(b) the main purpose was to establish that in a non-treatment situation, i.e., a simple test-retest without instructions, the groups would differ significantly in perceptual efficiency as measured by the four efficiency measures. This hypothesis was accepted. In addition each analysis of variance summary for the Accuracy score, the Time score and the Time-Accuracy score from Experiment A, (feelies) and also the summary for the Information Point score from Experiment B, (Rorschach cards), indicated a non-significant F test for the test-retest in the non-treatment condition.

The study of group mean differences indicated that the higher perceptual efficiency of the control group in the non-treatment condition was the major contributor to group differences. The control group differed significantly from the ulcer group in each of the four efficiency measures in the non-treatment condition. It was interesting that while the overall group differences in the Accuracy measure were

significant in the non-treatment situation, the study of paired differences in this measure showed that the control group did not differ significantly from the neurotic and orthopedic groups, although the differences were in favour of the controls. . Only in the Time-Accuracy measure did the neurotic and orthopedic groups differ significantly from each other. The other three measures of perceptual efficiency were similar for the neurotic and orthopedic groups in the non-treatment condition.

In the non-treatment situation the differences in perceptual efficiency for the groups are due to the superior performance of the control and ulcer groups. The finding that neurotics and orthopedics were not different in the Accuracy, the Time, and the Perceptual Information Point score but were significantly different in the Time-Accuracy measure in the non-treatment condition indicates a general similarity of perceptual efficiency for these two groups.

For hypothesis 2(a) and 2(b) the main purpose was to show that treatment, i.e. the verbal instructions to explore more actively, would produce a significant change in the scores for the total sample thus eliminating group differences. The null hypothesis that there would be no

significant group differences in perceptual efficiency following treatment was rejected.

The differences which were found are due mainly to the superior performance of the control group. The treated ulcer group differed from the treated control group only in the Accuracy measure. It will be recalled that in the non-treatment situation the control group and the ulcer group differed in all four measures of perceptual efficiency. That the ulcer patients did not differ generally from the control subjects after both groups received treatment suggests the effectiveness of the treatment for the ulcer patients. To achieve this favourable comparison the ulcer patients improved considerably with treatment.

The control group and the ulcer group tended to be separated from the other two groups after treatment more than before treatment. When the adjusted criterion means were compared for the neurotic and orthopedic groups no significant differences between them were found. The orthopedic patients had scores in the direction of less efficiency than did the neurotic patients. The separation of the control group and the ulcer group from the neurotic group and the orthopedic group after treatment is an interesting finding.

This bifurcation indicates that the relative degree of ability to improve perceptual efficiency is related to the degree of psychopathology but raises some interesting speculations about the adjustment of the orthopedic patients. Why this group should be comparable to a more generally recognized psychopathological group in perceptual efficiency is a question which merits further investigation.

Some reasons for the association of the orthopedic perceptual efficiency and neurotic perceptual efficiency are inherent in the theoretical considerations of this thesis. Aside from clinical observations in a hospital setting it is not usual to consider orthopedic patients as psychopathological. For the purposes of the present study the effects of long hospitalization and the traumatic effects of bodily injury were considered to have psychopathological consequences. The observations of Breuer and Freud (1936) add support to this consideration. They distinguish between "simple hysteria" and "traumatic hysteria" and state that the latter is not the result of physical injury but rather the result of psychic trauma. The painful affect of fear, anxiety and shame bring about the neurotic symptoms.

In addition to psychopathological implications

the orthopedic group are physically incapable of the gross movements exhibited by the subjects in the other groups. Exploratory activity was limited to the movements of hand and head in the majority of the subjects. They did not benefit from the proprioceptive feedback, described by Gibson, (1963) to the same degree as the other subjects. In accord with Gibson's theory the orthopedic group should be expected to be less perceptually efficient than the other groups. The finding that this was so is revealed in Tables 15, 17, 19, and 21 and the data on "Vigor" and "Card Turns" are in corresponding harmony.

That the neurotic group is similar to the relatively more inactive orthopedic group is interesting. One might conclude that the neurotics did not improve because of a corresponding inactivity. The findings from the orthopedic group suggest that neurotic behaviour accompanies alienation from environmental stimulation. This point was emphasized by the reference from Menninger (1963) in Chapter II.

The third hypothesis of the dissertation concerned the correlation of the Vigor scores and each of the four measures of perceptual efficiency. This hypothesis was accepted. The magnitude of the correlation coefficients was small but when

the hypothesis that they were significantly different from zero was tested it was accepted. Further research which could objectively measure individual exploratory activity might show the relationship between perceptual efficiency and movement of the sensory receptors more appropriately. To some degree, the subsidiary variable, Card Turns, in Experiment B, served this purpose. Table 23 indicates that the correlation between Card Turns and the Perceptual Information Point score was .502. To the degree that the subject actively manipulated the stimulus material he was more perceptually efficient. This finding supports the Gibsonian notion that information is more readily obtained from varying stimulation. The acceptance of Hypothesis 3 supplements the two major hypotheses of the dissertation.

It will be recalled that two separate experiments based upon a common theoretical rationale yielded the evidence to accept or reject the hypotheses. The stimulus material for Experiment A was the "feelies", while the standard Rorschach cards constituted the stimulus material for Experiment B. The statements about group differences in perceptual efficiency from the non-treatment and treatment conditions in either experiment are parallel in their content. The basic

theory appears to integrate the procedures and results of the two experiments remarkably well.

The adopted theoretical position was generally supported by the contrast in perceptual efficiency between the control group and the neurotic group. Only in the non-treatment situation for the variable of Accuracy was an insignificant difference found. In the treatment situation the neurotic group was consistently and significantly inferior in perceptual efficiency when compared to the control group. This finding indicates the relative ineffectiveness of the treatment for the neurotic group. That this could be so was anticipated from the theoretical considerations outlined in Chapter II. Neuroticism is related to a lesser degree of perceptual efficiency than obtained in subjects free from psychopathology.

Implications for Psychotherapy

The foregoing has been specific to the hypotheses of the research. The following discussion will investigate subsidiary findings and speculate concerning the application of Gibson's theory of perception as a function of stimulation to psychotherapy. Gibson defined perception in terms of an individual "being in contact with the environment". If an

individual can adequately obtain perceptual information he will more effectively discriminate essential relationships. To obtain the information in stimulation, in Gibson's sense, the individual should accept and investigate actively the available arrays of stimuli. Should the less receptive individual, i.e., psychopathological state, be encouraged in some way to actively explore the stimulation impinging upon his sensory receptors he will become aware of the invariants in a situation. This initial step in information processing precedes any further and necessary social coding of the invariants in stimulation. Both the reception of environmental stimulation of a biophysical sort and the individual's efficiency in integrating the information are basic to his adjustment to the environment. The present study has dealt heavily with the initial stage of discovering invariants in the physical stimulation which provide the information for the patient's adjustment. Alienation from environmental stimulation inhibits realistic information processing and precludes insightful adjustment.

It would be expected that treatment in the manner used in the two experiments of this dissertation should reduce differences in perceptual efficiency that exist among groups

with mild psychopathology. This expectation was not met as was shown by the rejection of hypothesis 2. The failure to meet the hypothesis was due to the varying degrees of improvement in perceptual efficiency in the whole sample and in particular to the marked improvement of the control and ulcer groups.

The data from the covariance analyses suggest two subsidiary approaches to observing the effects of treatment in the groups. If the adjusted post-score of the untreated control group for each measure of perceptual efficiency is used as a criterion, then comparisons of the treated psychopathological group adjusted means can be made which avoid the effect of the increased efficiency of the treated control group. This comparison would indicate whether the treated psychopathological groups differed from the untreated control group in any of the four measures of perceptual efficiency. The second approach to observing the effects of treatment within any one group would be to compare the non-treatment adjusted post mean with the treated adjusted post mean. The method for comparing adjusted mean scores is from Winer (1960, p. 585).

For the Accuracy measure there were no significant

differences - F critical ratio at .05 level - between the non-treatment adjusted retest mean score of the control group and the treatment adjusted retest mean scores of any of the three psychopathological groups. For the Time measure the adjusted treatment post scores from the ulcer group, the neurotic group and the orthopedic group were significantly different in the direction of improved efficiency than the untreated adjusted retest mean of the control group. For the Time-Accuracy measure the adjusted treatment retest scores were not significantly different from the untreated adjusted retest score of the control group. The measure from Experiment B, the P.I.T. point score showed an interesting comparison between the treated ulcer adjusted retest mean and the untreated adjusted retest mean from the control group. The ulcer group mean was significantly higher than the untreated control group mean. The neurotic group and the orthopedic group had also improved by treatment to show no significant difference with the untreated control group mean in Experiment B.

These comparisons of the treated adjusted retest scores from the three pathological groups with the untreated adjusted retest score from the control group offer evidence

that treatment did bring the perceptual efficiency of the psychopathological groups up to the standard of the untreated control group, for each of the four measures of perceptual efficiency.

The comparisons between the untreated adjusted retest mean scores and the treated adjusted retest mean scores of each group show the effects of treatment on any one group. For the four measures of perceptual efficiency the treated control group means were highly significantly different in the improved direction when compared to the untreated control group adjusted retest mean scores. It was previously noted that this improvement in the control group contributed to the general finding of group differences and to the interaction effects. There were significant differences in the four efficiency measures between the two treatment situations within each of the ulcer group and the orthopedic group. The neurotic group showed no significant differences in the adjusted retest means of the non-treatment and treatment situation for the Accuracy measure or for the Time-Accuracy measure. The neurotic group did show a significant improvement in the Time and P.I.T. Point score measures at the .05 level. Thus in two of the four measures of perceptual efficiency the

neurotic group did not improve with treatment. It is interesting to note from Tables 25 and 26 that the neurotic group had the lowest Vigor score and the lowest Card Turns score. The failure of the neurotic group to improve with treatment can be attributed, with the present theoretical frame of reference, to inability to attentively and actively explore the available stimulation from the experimental sources; to the possibility that subjects were attending to other sources of stimulation and to the possibility that exploratory activity was minimal. The experimental design of this dissertation gave a major emphasis to the last mentioned cause of perceptual inefficiency. If the sensory receptors fail to register the appropriate patterns in stimulation as an initial step in perception then efficiency is lowered. Menninger described neurotic behaviour as a diminuation of normal sources of energy, stimulation, new information, correct bearings and the like. Witkin et. al. described the kind of psychopathology which made an individual unable to manipulate the environment in contrast to being dependent upon the environment. His description corresponds to the psychiatric classification of the neurotic sample. Perhaps the neurosis is caused by the lack of movement and this passivity leads to the failure to actively explore in search of information.

The main concern of this dissertation has been to examine experimental evidence for group differences in perceptual efficiency. The second division of the present chapter has discussed aspects of the data which suggest that an approach to psychotherapy based upon Gibson's theory of perception as a function of stimulation might produce positive results if further research were carried out. In this particular study the time duration of therapy was brief but a general improvement in perceptual efficiency was obtained by verbally instructing the subject to explore the available stimulation more actively. It was demonstrated that psychopathology, in contrast to more normal states, is related to less efficient discriminations among stimuli and consequently poorer information processing. Experimentally induced exploratory activity in Gibson's sense produced differences between the perceptual efficiency of psychopathological groups and a control group. Further research is needed to ensure the validity of the implications for psychotherapy.

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APPENDIX "A"

KEY TO COLUMN HEADINGS
for RAW DATA

COLUMN #

1. Subject Number.
2. Age.
3. Accuracy score - pre-test.
4. Accuracy score - post-test.
5. Time score, seconds - pre-test.
6. Time score, seconds - post-test.
7. Perceptual Information Point Score - pre-test.
8. Perceptual Information Point Score - post-test.
9. Average Card Turns from pre and post test.
10. Vigor scores.

NON-TREATMENT SITUATION
RAW SCORE DATA
CONTROL GROUP

1	2	3	4	5	6	7	8	9	10
1	22	7	7	28.4	26.4	22.4	43.5	46.5	23
2	25	6	6	22.0	23.5	20.5	24.0	33.0	20
3	25	5	4	26.6	26.4	4.0	17.0	27.5	31
4	25	5	5	28.3	38.1	6.5	8.0	0.0	27
5	25	5	7	36.7	35.0	18.0	19.5	23.5	25
6.	28	5	7	34.5	32.4	10.0	12.0	34.5	26
7	30	2	4	38.4	78.7	7.0	8.0	33.5	28
8	36	6	5	40.1	43.0	9.5	10.5	66.0	22
9.	46	4	5	75.0	70.4	12.5	10.0	48.0	33
10	46	2	5	47.0	57.4	19.5	22.5	26.5	28
11	46	4	4	37.3	44.3	14.5	31.5	50.0	31
12	48	4	5	22.4	24.7	13.0	14.5	42.0	30
13	50	4	4	51.3	56.7	11.5	12.5	30.0	35
14	50	3	4	26.7	37.7	2.5	1.5	20.0	19
15	52	7	7	52.0	68.1	21.0	25.0	71.0	29
16	55	6	6	116.0	61.4	19.5	22.5	56.0	25
17	55	4	5	146.0	142.0	33.0	35.5	12.0	31
18	56	4	4	29.5	64.1	22.5	22.5	58.0	32
19	59	1	1	31.7	30.3	12.0	14.0	34.0	26
20	60	3	5	38.1	53.3	7.5	6.5	25.0	21

NON-TREATMENT SITUATION
RAW SCORE DATA
Duodenal Ulcer Group

1	2	3	4	5	6	7	8	9	10
1	31	1	2	58.1	69.1	8.5	12.0	51	32
2	32	1	1	53.0	51.1	8.0	7.0	14	19
3	37	3	4	68.7	49.3	11.5	9.0	33	19
4	38	2	2	23.0	30.1	3.5	3.5	0	20
5	41	2	4	28.4	45.9	9.0	9.5	1	23
6	41	5	4	30.0	21.3	9.0	17.0	32	23
7	42	3	4	52.1	58.0	7.0	11.0	23	22
8	42	5	5	60.4	73.1	8.5	8.5	0	21
9	42	1	3	56.6	113.0	10.5	9.5	41	19
10	45	3	2	12.0	21.3	6.5	7.5	0	29
11	46	1	2	106.0	153.5	5.0	8.0	16	37
12	47	2	3	47.6	70.5	9.0	10.5	0	29
13	48	2	1	53.0	80.0	0.0	0.0	2	28
14	48	6	5	76.7	47.3	25.5	29.0	7	32
15	49	2	2	47.0	37.0	5.0	5.0	15	16
16	50	4	4	19.3	26.4	19.0	18.0	22	14
17	59	5	2	43.0	42.0	12.0	5.5	32	20
18	59	3	3	56.1	60.0	6.5	14.0	14	22
19	60	2	1	21.1	29.3	5.0	5.0	2	23
20	60	0	1	57.6	64.0	19.5	16.0	14	6

NON-TREATMENT SITUATION
RAW SCORE DATA
Psychoneurotic Group

1	2	3	4	5	6	7	8	9	10
1	19	4	5	98.4	80.7	15.5	14.5	0	18
2	20	4	5	68.7	83.0	5.5	5.0	19	28
3	22	3	4	52.0	53.3	5.0	6.5	18	21
4	23	4	5	110.4	70.1	12.5	12.5	14	11
5	25	7	7	72.0	86.5	6.5	7.0	20	22
6	25	2	3	49.5	59.0	1.5	1.0	28	21
7	26	3	3	64.0	59.3	8.0	9.0	0	23
8	27	1	1	40.7	32.0	8.5	10.0	8	17
9	32	4	4	60.1	32.0	10.5	12.5	11	25
10	32	2	4	45.5	66.4	9.5	10.0	11	17
11	33	3	2	82.1	62.5	5.0	7.0	0	34
12	40	4	3	42.0	35.1	3.5	4.0	14	8
13	41	3	4	81.1	110.3	7.0	7.0	28	12
14	42	4	4	36.0	39.0	10.5	12.0	15	12
15	44	7	7	76.3	67.6	2.0	2.0	2	27
16	45	1	3	47.7	71.3	4.5	4.5	30	18
17	48	1	2	58.4	63.7	6.5	9.0	22	20
18	49	7	7	33.4	33.7	6.0	6.0	32	10
19	52	2	3	58.3	62.6	6.5	4.0	0	10
20	57	1	2	60.7	38.6	4.5	4.5	0	23

NON-TREATMENT SITUATION
RAW SCORE DATA
Orthopedic Group

1	2	3	4	5	6	7	8	9	10
1	20	5	5	114.7	124.3	15.5	14.5	22	32
2	20	6	7	95.7	102.6	5.5	5.0	2	25
3	25	3	3	94.3	106.1	5.0	6.5	20	24
4	26	4	3	33.7	38.4	12.5	12.5	22	13
5	27	5	5	69.1	34.4	6.5	7.0	3	30
6	30	4	4	80.4	106.1	1.5	1.0	0	13
7	31	1	1	69.7	74.8	8.0	9.0	0	11
8	34	0	1	81.7	78.0	8.5	10.0	25	20
9	35	3	4	54.0	43.0	10.0	12.5	4	10
10	36	5	6	70.6	67.4	9.5	10.0	14	30
11	38	4	6	67.8	92.1	5.0	7.0	19	34
12	40	3	4	80.4	82.8	3.5	4.0	31	28
13	43	2	2	84.7	90.3	7.0	7.0	32	9
14	45	4	3	61.1	82.7	10.5	12.0	14	12
15	49	2	2	72.4	79.8	2.0	2.0	14	23
16	50	3	3	78.1	69.5	4.5	4.5	22	14
17	54	3	3	58.0	50.0	6.5	9.0	22	10
18	55	0	2	86.6	67.6	6.0	6.0	15	4
19	57	5	4	55.0	56.0	6.5	4.0	0	22
20	60	2	3	61.7	88.1	4.5	4.5	14	14

TREATMENT SITUATION
RAW SCORE DATA
Control Group

1	2	3	4	5	6	7	8	9	10
21	22	1	5	50.2	44.7	13.5	20.5	55	22
22	23	2	5	27.0	17.4	16.0	29.5	40	29
23	30	2	6	48.6	35.6	24.5	45.5	63	25
24	33	4	4	14.3	11.3	6.0	22.0	17	25
25	35	2	6	25.3	33.4	10.0	20.5	30	21
26	35	3	7	31.3	13.8	21.0	33.5	43	31
27	36	3	4	81.4	48.1	26.0	38.5	46	33
28	39	5	7	47.0	29.4	20.0	32.0	50	23
29	40	4	6	38.6	15.6	15.0	14.5	28	29
30	42	2	6	35.7	31.6	6.5	17.0	38	32
31	45	4	7	83.3	61.3	12.5	20.5	42	36
32	47	5	7	46.0	32.0	16.5	27.5	35	26
33	48	1	3	26.4	27.1	9.5	15.0	26	35
34	48	3	6	41.4	49.4	16.5	22.5	45	27
35	48	6	7	189.0	34.0	13.5	24.0	38	28
36	50	3	4	64.1	65.8	10.5	23.0	43	32
37	50	6	7	100.9	41.5	4.0	10.0	28	25
38	53	4	6	89.4	48.3	12.5	20.5	37	27
39	53	4	6	53.0	47.0	12.0	23.0	25	26
40	65	4	6	86.6	37.4	11.0	15.0	29	27

TREATMENT SITUATION
RAW SCORE DATA
Duodenal Ulcer Group

1	2	3	4	5	6	7	8	9	10
21	30	4	6	28.0	15.0	5.0	9.0	29	19
22	33	2	2	35.6	14.4	4.0	13.5	22	27
23	34	5	6	21.0	18.1	6.5	15.5	28	12
24	41	2	3	46.5	38.0	5.0	13.0	15	11
25	41	3	2	43.5	20.5	2.0	9.0	20	29
26	42	4	6	31.7	35.3	3.0	9.0	34	23
27	42	2	4	45.4	38.0	7.0	20.0	26	30
28	42	4	6	33.0	41.0	6.0	14.0	12	27
29	44	2	3	67.3	22.3	8.5	16.0	20	35
30	47	4	7	65.0	31.4	3.0	8.5	24	21
31	48	3	4	35.3	19.3	6.0	17.5	24	19
32	49	3	5	65.3	63.6	6.0	13	20	14
33	49	2	3	90.0	80.5	19.5	28.0	42	32
34	49	3	4	53.0	36.0	16.5	11.0	14	21
35	49	3	4	52.0	29.3	4.0	8.5	33	18
36	51	0	1	21.3	27.5	7.0	11.5	17	18
37	52	1	3	28.1	20.3	6.5	13.5	20	25
38	60	4	6	49.0	47.5	10.0	15.0	51	20
39	67	2	3	31.7	43.7	3.5	8	15	21
40	67	3	5	50.4	32.0	4.5	11.5	20	26

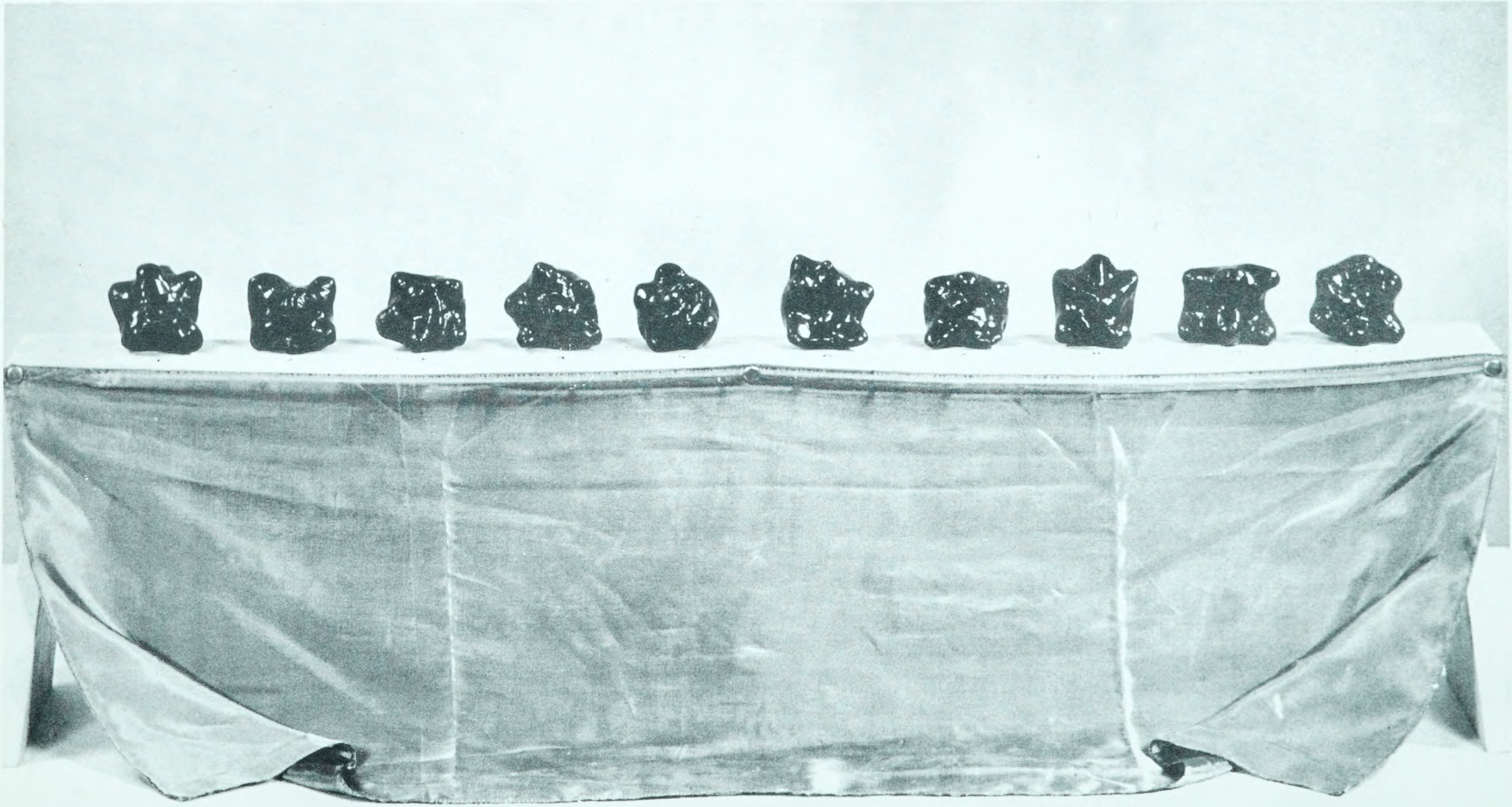
TREATMENT SITUATION
RAW SCORE DATA
Psychoneurotic Group

1	2	3	4	5	6	7	8	9	10
21	20	5	5	43.4	27.0	9.0	12.0	13	14
22	24	4	4	87.1	67.2	1.0	3.0	5	10
23	26	2	3	45.6	30.6	8.5	12.0	28	15
24	29	3	3	50.6	34.0	12.0	15.5	34	30
25	31	3	1	58.4	56.0	3.5	3.5	5	15
26	33	7	7	177.1	124.0	11.5	12.0	40	14
27	34	5	5	102.4	76.7	9.5	9.5	21	18
28	36	2	5	70.3	46.1	4.5	8.0	35	18
29	36	1	2	67.3	56.0	7.5	8.0	17	15
30	37	0	2	54.7	72.0	4.5	6.0	25	12
31	39	6	6	40.6	56.7	6.5	8.5	28	11
32	43	3	2	34.1	24.8	8.5	11.0	18	5
33	44	4	4	65.3	47.6	6.3	8.4	21	1
34	45	2	2	60.3	42.6	1.0	1.0	18	5
35	46	3	5	75.1	29.4	7.5	11.0	11	24
36	48	2	3	59.4	47.4	4.0	3.5	60	18
37	49	4	3	53.0	45.8	9.0	13.0	22	15
38	54	2	3	50.0	45.0	11.5	17.0	15	14
39	58	3	5	43.0	55.1	4.5	10.0	26	27
40	62	6	5	32.5	25.1	3.5	3.5	0	14

TREATMENT SITUATION
RAW SCORE DATA
Orthopedic Group

1	2	3	4	5	6	7	8	9	10
21	20	3	5	147.6	162.4	8.0	10.5	12	4
22	21	6	6	36.0	23.6	5.5	8.5	27	29
23	23	5	7	44.0	35.7	11.0	13.0	21	20
24	30	2	5	47.0	47.4	4.5	11.0	38	24
25	34	3	3	70.4	98.8	3.5	1.5	41	7
26	35	3	5	68.7	41.4	7.0	6.5	43	23
27	36	5	7	98.4	91.8	5.5	6.0	22	17
28	37	3	2	55.0	79.8	4.5	5.0	6	27
29	38	6	7	75.1	42.0	5.0	12.0	25	23
30	39	3	3	148.1	142.4	5.5	7.5	35	7
31	39	3	5	90.3	51.4	16.0	20.0	29	24
32	39	3	5	77.3	78.4	2.5	4.0	33	10
33	41	5	4	146.1	121.4	12.5	9.5	41	16
34	44	3	3	43.7	43.8	6.0	8.0	21	27
35	46	3	5	54.5	40.7	3.0	2.0	14	23
36	46	5	6	73.8	65.0	4.0	4.0	0	27
37	48	2	4	117.0	72.0	4.0	5.0	4	16
38	54	3	3	60.0	53.6	2.0	1.0	29	19
39	55	2	2	118.7	99.4	6.5	9.0	27	28
40	63	3	2	67.0	52.7	1.5	1.0	11	14

APPENDIX "B"



The Alberta "feelies".